ILLINOIS NATURAL HISTORY SURVEY
PRAIRIE RESEARCH INSTITUTE

Illinois Department of Transportation

The INHS IDOT Programs

Annual Report 2011

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2011 Annual Report

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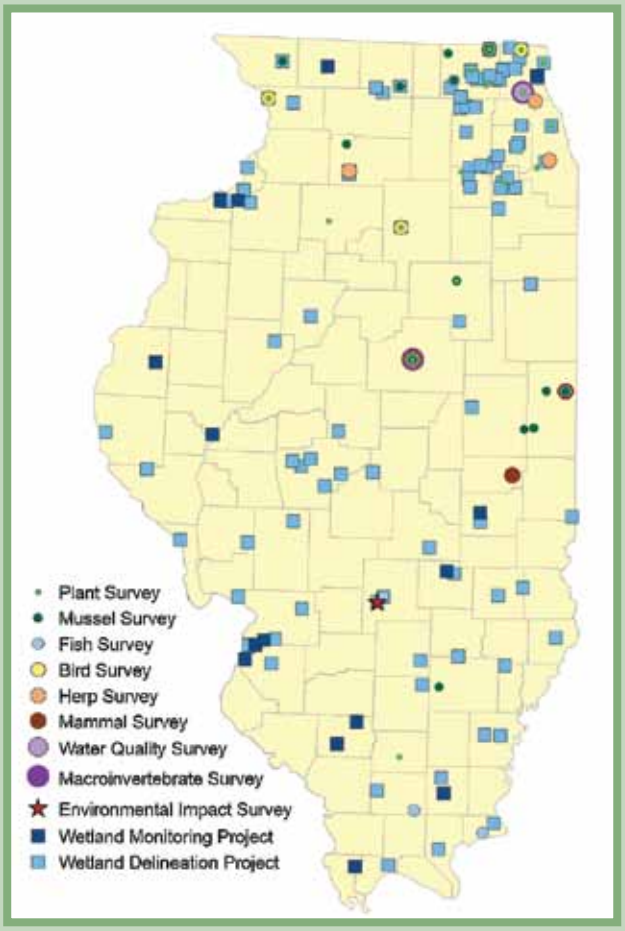
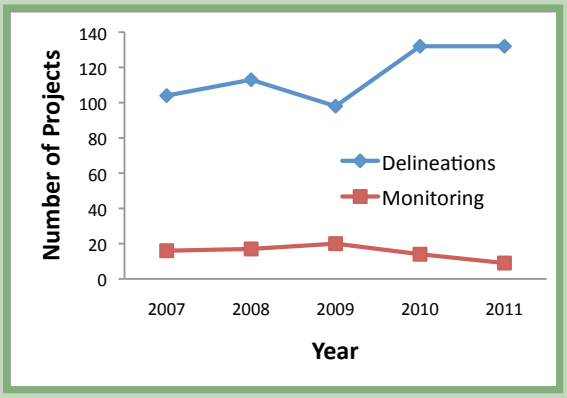
The INHS IDOT Programs

The INHS IDOT Programs are supported by 2 long-term contracts: the Wetlands Vegetation and Soils Program (Wetland Science Program) and the Biological Surveys and Assessment Program (Biological Surveys). These 2 programs and their antecedents have provided high-quality data on Illinois plants, wildlife, and their habitats to the Illinois Department of Transportation for over 30 years. These data help IDOT meet state and federal environmental mandates, and facilitate planning of new transportation projects to minimize their environmental impacts.

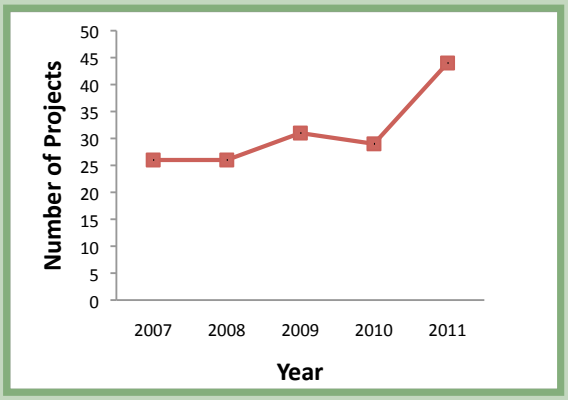
Wetlands delineations and monitoring, surveys for threatened or endangered species, habitat assessments and mapping, and related projects such as information in support of Environmental Impact Statements are conducted statewide. In 2011, these programs conducted 178 projects in 58 of 102 Illinois counties. As shown by the graphs below, the number of projects assigned to these programs has remained steady or increased over the past 5 years. Number of projects can underestimate the amount of actual work, as some projects are extensive, covering many square miles of area. For example, major projects in 2011 included the US Highway 51 expansion project, extending over 75 miles in 7 Illinois counties; the Eastern Richmond Bypass project, covering about 2,200 acres; and re-surveys of high-quality native prairie remnants along roadsides statewide. As repairs to our transportation infrastructure receive renewed attention, new highway projects such as the Illiana highway in northeastern Illinois are initiated, and new ventures such as high-speed rail are considered, the expertise of the INHS IDOT programs will be increasingly in demand.



Locations of INHS IDOT projects conducted in 2011



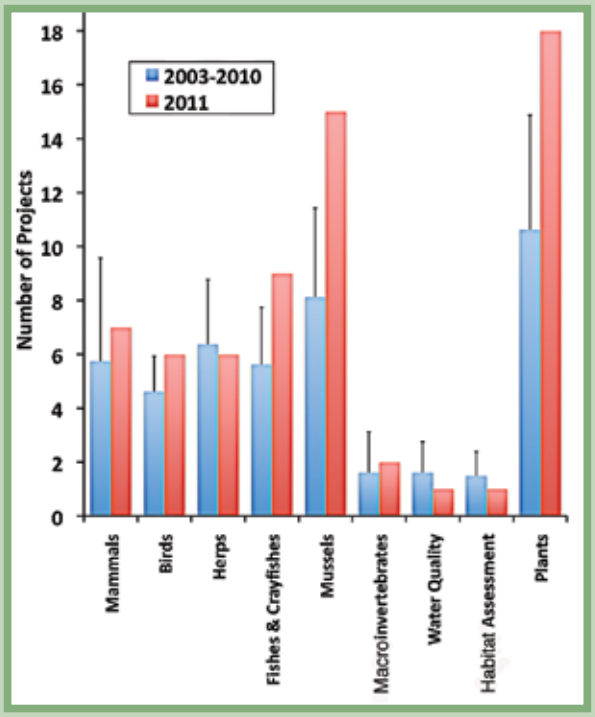
Numbers of wetland delineation and monitoring projects conducted by the Wetland Program over the past 5 years. Note the increase in number of delineation projects in 2010.



Number of projects conducted by the Biological Surveys Program over the past 5 years. Note the increase in 2011.

The depth of resources and support provided to these programs by INHS is unsurpassed. Our professional staff includes field biologists, taxonomists, GIS and GPS specialists, database specialists, and biological collections managers. Many of our scientists are nationally and internationally recognized experts in their fields. In addition, many INHS IDOT scientists are only partly supported by these programs, and maintain independent research, teaching, and outreach activities that add to their expertise and contribute substantially to the prestige of the programs.

Because this is our first such annual report, we have taken extra care to introduce selected aspects of the INHS IDOT Programs in the following pages, as well as highlight some of our staff and their research activities. Project reports submitted in 2011 are listed in a bibliography at the end.



Number of projects conducted by the Biological Surveys Program, separated by taxon. Demand for surveys of plants, mussels, and fish were particularly high in 2011.

Wetlands Vegetation and Soils Program

Wetlands are transitional areas between aquatic and terrestrial habitats where water occurs at or near the soil surface during the growing season. They provide diverse and sometimes specialized habitats for aquatic and terrestrial wildlife and plants. Forty-three percent of federally threatened and endangered species rely directly or indirectly on wetlands for their survival. Wetlands also provide critical ecosystem services such as water filtering, carbon sequestration, and flood control. For example, wetlands provide the conditions needed for the removal of both nitrogen and phosphorus from surface water. Reduction of nitrogen and phosphorus helps reduce problems from runoff such as algal blooms, dead zones, and fish kills that are generally associated with excess nutrients. Wetlands store carbon within their live and preserved (peat) plant biomass instead of releasing it to the atmosphere as greenhouse gas. By storing and releasing surface water, rain, snowmelt, groundwater, and flood waters, some wetlands help to maintain stream flow during dry periods. Wetland vegetation also abates the flow of flood waters, distributing them more slowly over the floodplain. Wetlands help protect shorelines and stream banks from erosion, and break up the flow of stream and river currents. Finally, wetlands provide recreational and economic benefits. Wetlands contribute to nature-based tourism such as bird watching, as many songbirds, waterbirds, and waterfowl are wetland dependent. Three million migratory bird hunters in the U.S. generate about $1.3 billion in retail sales annually. Forested wetlands support about 55 million acres of timber nationally. Wetlands can reduce the likelihood of flood damage to homes, businesses, and crops in agricultural areas, reducing insurance costs and providing greater protection to human health, safety, and welfare.

Juristictional wetlands require saturated soil or standing water and wetland-adapted vegetation

Core samples are used to confirm hydric soils and delineate wetlands

Wetlands are characterized by 3 primary components: 1) saturation to or near the soil surface, shallow periodic ponding, or permanent ponding; 2) vegetation that is adapted to living in saturated or ponded soil conditions for various lengths of time; and 3) soils that are saturated or ponded for long enough during the growing season to have anaerobic conditions. In Illinois, wetland types include floodplain forest, marsh, swamp, forested bog, graminoid bog, fen, forested fen, sedge meadow, panne, spring, wet prairie and calcareous seep (see following pages). Floodplain forests are increasing, but marshes, swamps, sedge meadows, springs, wet prairies and calcareous seeps are decreasing. Pannes and bogs are protected.

About 8 million acres, or 23%, of Illinois was once wetland, but an estimated 85% of that has been destroyed by conversion to agriculture or other development. Wetlands are currently federally protected under Section 404 of the Clean Water Act. The U.S. Army Corps of Engineers regulates most potential wetland impacts with a policy striving for no net loss of wetlands. In addition to the federal mandates, in 1989 Illinois enacted the Illinois Interagency Wetland Policy Act. This act states that there should be no net loss of wetlands due to state-supported activities and that state agencies will mitigate for their wetland impacts. Thus, wetland delineation and mitigation in relation to all transportation infrastructure projects are required by law.

The INHS Wetland Science Program provides federally mandated data on impacts of highway projects related to existing infrastructure, helps IDOT plan new projects in a way that minimizes potential impacts to existing wetlands, and monitors mitigation projects. Our professional staff includes experienced botanists, soil scientists, and GPS /GIS experts. We currently conduct about 125 delineation and monitoring projects annually, requiring extensive time in the field and in preparation of reports. Our Wetland Science Program also maintains a valuable database derived from current and legacy wetlands data, and addresses important research questions related to wetlands conservation and ecology. The INHS Wetland Science Program is unique in being able to provide this depth of expertise.

Marsh vegetation at Fourth Lake Fen Forest Preserve in Lake County

Wetland Science Program Field Studies

In order to obtain Section 404 permits for road work, any wetlands occurring within a project corridor must be delineated and mapped. IDOT must also mitigate for any wetland acreage destroyed during a construction project to achieve no net loss of wetlands. The Wetland Science Program is composed of botanists, soils scientists, and GIS specialists who work in teams to perform wetland determinations, assess potential wetland mitigation sites, and monitor mitigation sites as they become established.

A site legally designated a wetland must meet the criteria established by the U.S. Army Corps of Engineers for wetland hydrology, hydric soil, and hydrophytic vegetation. Delineation teams travel into the field statewide to evaluate potential wetlands by examining these features. Teams also delineate and sample vegetation at mitigation sites over multiple years to monitor sites' progress toward meeting wetland criteria.

A delineation team comprises at least one botanist and at least one soil scientist. Each project is assigned to a lead author, who is responsible for directing the team in the field and writing a report of the team's findings. The lead author consults National Wetland Inventory (NWI) and local wetland maps, topographic maps, and aerial photos ahead of field work to see where wetlands might occur in a project corridor. Wetlands are mapped in the field with a GPS. Back in the office, a GIS specialist uses these data to create maps for each project.

Soil scientists consult the local soil survey to gain insight into the types of soils present in a project area before heading to the field. While in the field, the "Field Indicators of Hydric Soil" developed by the Natural Resource Conservation Service are used to determine if a soil is hydric or not. Soil scientists then take as many soil samples as are needed to determine a hydric soil boundary for each wetland.

Dennis Keene checking soil color at a potential wetland site near Belleville, St Clair County

Valerie Sivicek and Dave Ketzner botanizing in a floodplain forest near IL 3 and Piasa Creek in Madison County

IL 178 Bridge over the Illinois River at Utica, LaSalle County

Scott Wiesbrook crossing a railroad trestle along a future extension of the Sangamon Valley trail north of Springfield in Sangamon County

Botanists determine whether the dominant vegetation at a potential wetland site is hydrophytic (adapted to living in saturated soils or standing water). Plant species have been assigned a wetland indicator status ranging from OBL (Obligate, almost always found in wetlands) to UPL (Upland, almost never found in wetlands). More than 50 percent of a site's vegetation must have a hydrophytic indicator status in order for the site to meet the requirement for wetland vegetation. Botanists visually examine a site's vegetation to estimate dominance, and compile a full list of the plant species present at a wetland site. At mitigation sites, vegetation is often sampled quantitatively. Botanists also must be constantly on the lookout for threatened and endangered plant species during all field work.

Wetland determination projects can vary in size from areas of <1 acre adjacent to a rural bridge, to several acres encompassing a highway overpass, to corridors encompassing proposed new highway routes that cover 50 square miles. In 2011, the Wetland Science group evaluated 132 project areas for wetlands, ranging from areas with 1 site and no jurisdictional wetlands to project areas with 115 sites, 110 of which were wetlands. Consequently, wetlands reports vary in size and complexity depending on the project, but must include technical forms required by USACE for each site investigated, precise maps delineating jurisdictional wetland boundaries and locations, and full species lists with a calculation of floristic quality for each wetland site. On a yearly basis, the Wetland Science Program also monitors between 15 and 20 mitigation sites. These sites are designed and constructed to mitigate for wetland impacts due to road projects. An individual site is typically monitored for 5 years and while each site may have its own monitoring requirements, they all have a similar goal - wetland creation or restoration. Aside from monitoring site progress towards becoming a jurisdictional wetland, some of the typical parameters monitored include tree survival if trees are planted and quantitative sampling of herbaceous species if site floristic quality or species composition is important.

Illinois Wetland Types

Wet Floodplain Forest

Characterized by frequent or prolonged flooding; along streams throughout Illinois
Common plants: Trees - silver maple, cottonwood, sycamore, red maple river birch, black willow, box elder, green ash; Herbs - Virginia wild rye, wood nettle

Wet Prairie

Less diverse than other prairie communities; was generally distributed throughout the prairie regions of Illinois
Common plants: Bluejoint grass, sedges, prairie cordgrass, winged loosestrife

Marsh

Dominated by tall graminoids (grass-like plants); water near or above the soil surface for most of the year
Common plants: Cattails, bulrushes, sedges, smartweeds, common water plantain

Swamp

Forested, permanent or semi-permanent body of water; restricted to extreme southern Illinois
Common plants: Swamp tupelo, bald cypress, buttonbush, pumpkin ash, Virginia willow, swamp rose

Bog

Low nutrient, acid peat deposit; nearly always in glacial depressions with restricted drainage; restricted to the Northeastern Morainal Division of Illinois
Common plants: Sundews, pitcher plants, sedges, Sphagnum moss, bog buckbean

Fen

Peat with calcareous seepage is necessary for all fen communities; restricted to the northern third of Illinois, extending down the Illinois River
Common plants: Sedges, Ohio goldenrod, Kalm's lobelia

Illinois Wetland Types

Shrub-scrub Wetland

May be "true shrub" wetlands or early successional floodplain forest wetlands; found throughout Illinois
Common plants: Dogwood, willows, alder or young silver maple, green ash, cottonwood

Shrub Swamp

Permanent or semi-permanent body of water with >50% shrub coverage and <20% tree coverage
Common plants: Buttonbush, red-osier dogwood, pussy willow, sandbar willow, speckled alder

Sedge Meadow

Very homogenous community dominated by sedges on peat, muck or wet sand
Common plants: Lake sedge, bluejoint grass, woolly sedge, tussock sedge, spotted Joe-Pye weed, turtle head, bog willow herb

Wetland Pond

A small still body of water, shallow enough to allow rooted aquatic and emergent plants to grow; not all ponds are wetlands
Common plants: Pondweeds, duckweeds, white water lily, yellow pond lily, American lotus, beggar's ticks, rice cutgrass

Seep

An area with saturated soil caused by water flowing to the surface in a diffuse rather than concentrated flow
Common plants: Sedges, marsh marigold, skunk cabbage, turtlehead, rough-leaved goldenrod, angelica

Other Uncommon Wetland Types

Panne – wet and wet-mesic swales in calcareous sand within 1 mile of Lake Michigan; extremely rare wetland type for Illinois; common plants include bluejoint grass, twig rush, lake shore rush, shrubby cinquefoil, small yellow flax

Flatwoods - Flatwoods occur on level or nearly level soil that has an impermeable or slowly permeable layer, which causes a shallow, perched water table

Wetland Science Program Research Group Activities

In the fall of 2011 the INHS Wetland Vegetation and Soils Program formed a new Research Group that includes Jeff Matthews, Dennis Skultety, and Laura Sass. The initial goals of this new group are to create a Wetland Science Program website, develop a database to support IDOT wetland survey work, and facilitate research activities that utilize IDOT wetland survey data or improve our understanding of wetlands in Illinois.

Wetland Science Program launches new website

The Wetland Science Program developed a new website in 2011 that was launched in April 2012. The website, designed by Laura Sass, highlights services provided to IDOT, education and outreach activities, and scientific research. The website also includes individual staff pages and a wetlands photo gallery.

New Wetland Science Program homepage

Wetland Science Program database development

IDOT has supported wetland surveys by the INHS since 1987. Since then, the soil scientists, botanists and GIS specialists of the Wetland Science Program have delineated thousands of wetlands throughout Illinois and monitored vegetation and soil development in over 58 wetland mitigation project areas.
A top priority of the research group has been the development of a new wetlands database with the following objectives:

1. Provide a searchable database of IDOT wetlands projects to support project tracking and project-specific information retrieval.
2. Organize a geodatabase of Wetland Science Program GIS data that can be linked to the project database.
3. Provide a searchable database to facilitate statewide wetlands research by the Wetland Science Program.
4. Create a database that provides output (including wetland delineation forms, plant species lists and summary information) that will be included in project reports to IDOT.
5. Maintain a flexible database that accommodates differences in reporting requirements among IDOT and U.S. Army Corps of Engineers districts, and can be adapted quickly to new requirements.
6. Develop a network database that allows multiple users to input data simultaneously.

Wetland Science Program field staff have access to the new database, designed by Laura Sass, and input field-collected data through a Microsoft Access data entry interface. Once all data for a project have been entered, the database automatically generates completed U.S. Army Corps of Engineers wetland delineation forms for each wetland delineation sample point, plant species lists and floristic quality assessment values for each wetland site, and summary information for each delineation site. These outputs are then used directly in Wetland Science Program reports to IDOT. The database includes several automatic calculations and dropdown menus, facilitating rapid data entry and consistency among users.

Database design and maintenance is ongoing. Dennis Skultety has organized all of our available wetland GIS data into a single geodatabase that will be linked eventually to the project database, providing mapping capabilities. We are currently working on integrating our wetland mitigation monitoring data into the database, inputting a backlog of wetland report data from the 2011 field season, and digitizing older wetland maps from the pre-GPS era when delineations were drawn by hand on hard copy aerial photographs.

Currently, the database includes approximately 1,700 wetland projects and 10,000 wetland delineation sites and over 100,000 plant species records. These data will be used by the Wetland Science Program for IDOT project tracking and statewide wetlands research.

Wetland Science Program research highlights

Jordan Jessop, a new M.S. student in the department of Natural Resources and Environmental Sciences at the University of Illinois, joined the Wetland Science Program in the fall of 2011. Jordan and Jeff Matthews, along with collaborating faculty and students from NRES and colleagues from INHS, will initiate a project in 2012 to explore tradeoffs among ecosystem services provided by restored wetlands.

Geoff Pociask (ISGS Wetlands Geology Section) and Jeff Matthews received a grant from the Illinois Center for Transportation to use legacy data from the INHS and ISGS wetlands programs to study the impact of past flood disturbances on plant communities and the achievement of performance standards in IDOT mitigation wetlands. In addition, they are establishing sample plots to evaluate ongoing tree survival at newly constructed IDOT wetland mitigation sites. The expected outcome of this research is a better understanding of the influence of flooding on the development of plant communities at IDOT wetland mitigation sites. Through this research, we will provide information for improved planning and maintenance strategies for wetland mitigation projects and identify appropriate performance standards for wetland mitigation in frequently flooded areas. Geoff and Jeff presented preliminary results at the Bottomland Ecosystem Restoration Conference in Collinsville, IL in March, 2011.

Training the Next Generation of Wetland Scientists...

Wetland Science Program botanist Dr. Jeff Matthews is an Adjunct Assistant Professor in the Department of Natural Resources and Environmental Sciences at the University of Illinois, where he guest lectures, advises graduate and undergraduate research, and teaches. Dr. Matthews has been teaching a Wetland Delineation and Classification course at the University of Illinois since 2008. This field-based class is designed to teach mastery of wetland delineation. In the course of learning this skill, students are also introduced to broader content including basic wetland ecology and environmental policy. The course is broken down into a series of milestones that reflect steps in the federal procedure, and it culminates in a project requiring students to work in groups to repeat the entire process in the field, delineating a wetland on their own. After graduation, former students in the class have found jobs in the environmental consulting industry, delineating wetlands as a career.

...and Soil Scientists

Soil scientists not only have to understand how to read and use the "Field Indicators of Hydric Soil," they also need to be able to read and understand soil profiles within the context of the landscape. This is a concept introduced during coursework at the undergraduate level, and reinforced during hands-on learning through field-based activities and soil judging competitions.

Wetland Science Program soil scientist Scott Wiesbrook has been involved in soil judging since 1989, first as a competitor and now as a coach for both the University of Illinois and Blackhawk College - East Campus (currently the two-time defending national champions in their division). Through Scott's efforts, college students gain a deeper understanding and appreciation of soils and the whole pedologic process. With the study of soils becoming more lab-based, field-based learning opportunities are becoming less common. The decrease in practical field knowledge is not just a problem in the field of soil science but appears to be a general trend in the natural sciences.

INHS Botanists Discover New Wetland Plant Species for Illinois

Wetland Science Program botanists Paul Marcum and Dave Ketzner discovered a large population of *Lythrum hyssopifolia* (hyssop loosestrife or grass poly) while conducting IDOT wetland delineations in McHenry County in June 2011. This annual Old World native, found in ruderal wetland plant communities, had not previously been known from Illinois. It was first collected in the U.S. around 1815, and has since become occasional to frequent in the Northeast and along the West Coast. Like many other recent invaders of Chicago-area roadside wetlands, *L. hyssopifolia* is salt-tolerant. This species is also known to have long-lived seeds. Due to plentiful suitable habitat along roadways, at sites disturbed by construction, and in farmed wetlands, *L. hyssopifolia* is likely to spread and persist in northeast Illinois.

Lythrum hyssopifolia in McHenry County

Research in Plant Systematics

In 2011, Wetland Science Program botanist Mary Ann Feist presented her doctoral dissertation research at the International Botanical Congress in Melbourne, Australia, and at the 7th International Apiales Symposium in Sydney, Australia. She completed her doctoral degree this past year in the Plant Biology Department at the University of Illinois. For her dissertation project, Dr. Feist conducted a phylogenetic and monographic study of *Oxypolis* (cow-bane) and *Ptilimnium* (mock bisop-weed) from the Apiaceae (Carrot family). Based on this phylogeny and the corroboration of morphological and fruit anatomical data, new circumscriptions for the genera *Oxypolis* and *Ptilimnium* were made. The 2 genera (*Oxypolis* and *Ptilimnium*) were split, 2 genera (*Tiedemannia* and *Harperella*) were resurrected, and new combinations were made. Finally, taxonomic treatments including keys, species and genus descriptions, and brief taxonomic discussions were written for *Ptilimnium*, *Tiedemannia*, *Harperella*, *Limnosciadium*, *Cynosciadium*, and *Oxypolis* and submitted for publication in the *Flora of North America*.

Biological Surveys and Assessment Program

The IDOT and the Illinois Toll Highway Authority contract with the INHS to conduct field surveys of plants and animals at sites proposed for highway projects and natural areas statewide in order to ensure that transportation projects initiated through IDOT are in compliance with State and Federal environmental laws and regulations. Our mandate is to assess flora and fauna of planned project locations for potential impacts on natural resources, including protected species and habitats, so that IDOT can reduce or eliminate adverse environmental impacts or identify mitigation or remediation actions to achieve the best possible outcome during project development, design and construction. Specifically, our role is to determine the presence of threatened and endangered species at sites under consideration for IDOT projects.

Lithasia geniculata

Freshwater Mollusks

Freshwater mollusks are sensitive to stream habitats, making them good biological indicators of stream integrity. INHS manages systematic collections that have been carefully maintained, and INHS scientists have engaged in extensive efforts to re-examine watersheds and relocate previously recorded localities for some species, thus we are uniquely able to provide information regarding species distribution and populations. Freshwater mollusks are one of the most imperiled groups of animals in North America. Two-thirds (53) of Illinois' 80 freshwater mussel species are extirpated from the state, listed at the state-level, or have relatively unstable populations. A similar pattern appears true for the state's 76 species of freshwater snails.

"Hand grubbing" for freshwater mussels in the Skillet Fork, Wayne County, Illinois

The INHS Mollusk Collection staff is involved in several freshwater mollusk projects. Collaborative efforts between the INHS and the Illinois Department of Natural Resources (IDNR) are underway to update the current status of freshwater mollusks in the state. Since 2008, we have been capturing freshwater mollusk data by visiting natural history museums and conducting field surveys throughout the state that typically correspond with predetermined IDNR fisheries and Illinois Environmental Protection Agency basin survey sites. Natural history museum collections represent a unique and invaluable source of data on the distributions and historical occurrence of Illinois freshwater mollusks, whereas current surveys provide data on changes in assemblage structure, population declines, and shrinking distributions that are occurring in the state. For native species, we have documented several new basin records, including one for a federally endangered mussel (fat pocketbook, *Potamilus capax*), and have found a snail (ornate rocksnail, *Lithasia geniculata*) never before collected in the state. For non-native mollusks such as the zebra mussel (*Dreissena polymorpha*) and Chinese mystery snail (*Bellamya chinensis*), we are documenting their distributions moving towards more inland waters, probably as a result of humans (e.g., canoeing or aquarium releases). The data we collect will assist natural resource agencies by filling knowledge gaps in the Illinois Comprehensive Wildlife Conservation Plan, assisting water quality initiatives, guiding restoration and conservation initiatives, and aiding the Illinois Endangered Species Protection Board in determining the state status of rare freshwater mollusks.

INHS staff also are involved with reintroducing the federally endangered northern riffleshell (*Epioblasma rangiana*) back into Illinois. Beginning in 2005, Illinois partnered with the U.S. Fish & Wildlife Service (USFWS) and state agencies in Pennsylvania and Ohio to implement portions of the USFWS' Northern Riffleshell and Clubshell (*Pleurobema clava*) Recovery Plan. The northern riffleshell has not been seen alive in Illinois in approximately 100 years and was considered extirpated from the state. A salvage project in Pennsylvania on the Allegheny River provided an opportunity for the translocation of 150 specimens during the summer of 2010. These individuals were translocated to the Salt Fork and Middle Fork of the Vermilion River. Future plans include regular monitoring of both sites several times over the next 5 years.

The federally endangered northern riffleshell being fitted with passive integrated transponder tags prior to translocation

Fish

More than half the state boundaries surrounding Illinois are water – to the west is the Mississippi River, to the south is the Ohio River, to the east is the Wabash River, and to the northeast is Lake Michigan. These drainage systems, as well as the numerous interior streams, kettle lakes, and wetlands in northern Illinois, and cypress-tupelo swamps in southern Illinois, help create a species-rich fauna. There are 192 species from 30 families of fish native to Illinois, and they vary greatly in their size, appearance, distribution, and preferred habitats. Fishes vary in their movement as well. Some only move a few yards during their life, whereas others can migrate thousands of miles to complete their life cycles.

Spotted gar (*Lepisosteus oculatus*), a top predator in many streams in Illinois

Prior to 1800, humans probably had little effect on the fish fauna of Illinois. During the 19th century, land use in Illinois changed drastically when much of the Illinois landscape became dominated by row-crop agriculture. These changes forever altered aquatic ecosystems. Surprisingly, however, only 10 species of fish have become extirpated, although 19 species are listed as state-endangered and another 12 are listed as state-threatened. As climate and aquatic environments change, fish assemblages could become less resilient to changes and more species could become extirpated.

IDOT surveys require using multiple methods. Some fishes, such as the state-threatened eastern sand darter (*Ammocrypta pellucida*), are collected with either a trawl or seine. These methods were employed during work on the US Hwy 51 project near Vandalia. Other fishes, such as the state-threatened starhead topminnow (*Fundulus dispar*), live near the water's surface and can be captured with dipnets, similar to what you buy at a pet store. This method was used during sureveys near the US Hwy 12 bypass near Richmond. Yet other fishes, such as the state-endangered northern brook lamprey (*Ichthyomyzon fossor*), live around physical structures (e.g., woody debris or rock out-croppings) or in deep water and are best collected with electricity supplied from a boat or barge, which temporarily immobilizes fishes and allows them to be easily captured. Electroshocking typically collects the highest diversity of fishes. No method captures all species present; however, when used together, the above methods collect a true representation of the fish assemblage present at a given site.

Aquatic Macroinvertebrates

Aquatic macroinvertebrates vary widely in their vulnerability to environmental perturbations. Some species can survive and occasionally prosper in extremely polluted waters, while others require clear, clean, relatively pristine conditions to survive and reproduce successfully. Through many years of study of these tolerance differences, biologists have constructed several methods for arriving at an Index of Biotic Integrity (IBI), based on which macroinvertebrates are present, and their relative abundance in a given stream. Our surveys of stream macroinvertebrates at IDOT project sites produce site-specific IBI scores, and these scores serve as one of several parameters that help determine the optimal placement of roadway alignments.

Although only a few state or federally listed aquatic macroinvertebrates occur in Illinois — most notably the Hine's emerald dragonfly (*Somatochlora hineana*) and the Illinois cave amphipod (*Gammarus acherondytes*) — we also assess project alignments for the potential presence of listed taxa, those under consideration for such listing, and those considered rare in the state. During the past 4 years (2008–2011), nearly 250 aquatic macroinvertebrate samples have been collected from 50 sites associated with IDOT highway projects across Illinois. Over 23,500 animals representing 5 phyla, at least 75 families, and more than 350 species were sorted and identified from these samples.

Water Quality Assessments

Water quality assessments are conducted seasonally primarily at streams that are within or adjacent to IDOT highway project sites. The primary objectives of water quality assessments are to document the physical characteristics and chemical components of water — to establish baseline data and to identify changes as well as trends in water quality over time for each site and its drainage basin. The procedures for water quality assessments include field measurements of 9 physical and chemical parameters and the collection of water samples for laboratory analyses to determine the values for 40 organic and inorganic constituents, including metals, per sample. These data are integrated into IDOT reports along with results of surveys for aquatic biological resources (i.e., fish, macroinvertebrates, mollusks, crayfish).

Logperch (*Percina caprodes*), an important host fish for some freshwater mussel species

Reptiles and Amphibians

Herpetology is the study of amphibians and reptiles. Amphibians are constrained to wet or moist environments because their skin and egg membranes are permeable to water. Reptiles, on the other hand, are less dependent on water because they have a scaly waterproof skin and their eggs are protected by a thick shell. Amphibians have a bi-phasic lifestyle whereby they first go through a larval period prior to metamorphosis into adults.

Mudpuppy *(Necturus maculosus)*, a state-endangered species

Blanding's turtle (*Emydoidea blandingii*), a state-endangered turtle

There are 104 species of amphibians and reptiles recognized within the boundaries of Illinois. Illinois boasts 20 species of salamander and 21 species of frogs and toads. Reptiles are represented by 6 lizards, 17 turtles, and 40 snakes. The Illinois Endangered Species Protection Board currently recognizes 9 amphibians and 18 reptiles as threatened or endangered in the state. This unfortunately means that more than 25% of our herpetofauna is at some level of risk for extinction in the near future. When these species occur in the vicinity of IDOT projects, the Biological Surveys Program conducts surveys for state-listed species and their associated habitats.

Survey methods vary by species, habitat, and even by season. Pond-breeding amphibians are best surveyed during the breeding season when they congregate at wetlands. During this time, frogs, such as Bird-voiced Treefrogs and Illinois Chorus Frogs, can be identified by their unique breeding calls. Since salamander males do not call but rather dance for their mate, Jefferson Salamanders must be captured with minnow traps, dip nets, or by hand.

Outside of the breeding season, surveys for pond-breeding amphibians consist of dip netting or trapping for larvae until they metamorphose and move into the terrestrial environment, or the ponds dry.

Stream- and seep/marsh-dwelling salamanders such as the Dusky Salamander and Four-toed Salamander are surveyed for by visual encounters, transect surveys, or time-constrained searches, whereby researchers visually search an area, distance, or a particular period of time, examining all possible hiding spots in an attempt to find the species. While not ideal, these methods can also be used for pond-breeding amphibians outside of the breeding season.

Jeremy Tiemann checking turtle trap in a wetland in McHenry County

Fully aquatic amphibians such as Hellbenders and Mudpuppies can be trapped using modified baited minnow traps. Alternatively, they can be surveyed by flipping cover objects in rivers and streams.

Aquatic turtles are frequently sampled by using a large trap with funnel ends. Omnivorous species such as Blanding's Turtles are trapped using smaller hoop traps baited with sardines, chicken livers, or bait fish. Vegetarian species such as River Cooters are trapped using larger hoop traps with long nets extended out into the water body in an attempt to intercept and funnel the turtles into the trap. Regardless, all traps are checked at least every 24 hours.

John Crawford sampling amphibians with a dip net

Surveys for turtle species that bask can be augmented by using a spotting scope to identify species. Some species, such as Spotted Turtles and Blanding's Turtles, are considered semi-aquatic, and are also effectively sampled by visual encounter surveys.

Terrestrial reptiles including most snakes and Ornate Box Turtles are surveyed primarily by visual encounters. If surveys will be conducted over multiple years, cover boards or drift fences may be placed at survey sites. Cover boards consist of clearing a small area and then placing a piece of plywood, corrugated tin, or rubber (such as a mudflap) flat on the ground to provide cover. These are then routinely checked and lifted to see which organisms might be using them. Drift fences usually consist of anti-siltation fabric with funnel traps placed at the ends, and buckets dug into the ground with the bucket lip at ground height. Animals that encounter the fences travel along the fence and either fall into a bucket or enter the funnel traps.

Copperbelly water snake (*Nerodia erythrogaster neglecta*)

In spite of the many survey methods available, some amphibians and reptiles remain difficult to detect. Often, detailed intensive surveys fail to turn up target species. This obviously makes definitive statements about the occupancy of most species difficult. In these cases, assessments must be made based on knowledge of the species and of their habitat requirements.

Cave Biology

Dr. Steve Taylor's research focuses on cave and karst ecosystems. This work has bearing on future biological surveys for IDOT. In Illinois, Steve has conducted a variety of studies on cave faunas, including studies of the Illinois cave amphipod (*Gammarus acherondytes*), a species listed as endangered by the U.S. Fish and Wildlife Service. His current research in Illinois focuses on the state-endangered enigmatic cavesnail (*Fontigens antroecetes*) and on white-nose syndrome in bats. He also works at other locations across the United States into Central America, with a current project focusing on biodiversity in caves of southern Belize. Steve conducts research on other aquatic and terrestrial invertebrates, including bioinventories of Illinois Nature Preserves, and works with state and federal agencies to help facilitate management of rare, threatened, and endangered invertebrates, such as the federally listed Hine's emerald dragonfly (*Somatochlora hineana*), and to help develop management and monitoring plans for cave and karst ecosystems.

Steve Taylor squeezing through a tight spot while conducting cave research

Vernal crayfish (*Procambarus viaeviridis*), a rare Illinois crayfish found in southern Illinois

Crayfish Biology

Dr. Chris Taylor's research focuses on the ecology, systematics, and conservation of crayfishes and fishes. Chris has published numerous papers on the conservation of North American crayfishes and is recognized as a leading expert on the topic. He has also published a book on the crayfishes of Kentucky and is working on another for species found in Alabama. In addition to publishing on the conservation of crayfishes, Chris has described 7 crayfish species new to science. Illinois is home to 4 species of crayfishes listed as state endangered, all of which have very restricted ranges. They normally inhabit smaller streams and when those streams intersect future IDOT project sites, protective measures must be implemented to assure their continued existence at those sites.

Redspotted Sunfish Re-introduction

The redspotted sunfish (*Lepomis miniatus*) occurs in clear, sluggish, well-vegetated streams and backwater lakes from the Illinois River basin south through the Mississippi River Valley. Within Illinois, it historically had a sporadic distribution that included bottomland lakes along the Illinois River, the LaRue-Pine Hills Ecological Area (Big Muddy River drainage), and backwater lakes along the Wabash and Ohio rivers. Although never abundant in Illinois, the distribution of *L. miniatus* has been reduced in the state due to habitat destruction (e.g., drainage of backwater lakes). As a result of this reduction, it was listed as state-threatened in 1989. Jeremy Tiemann (INHS), Trent Thomas (IDNR), and John Epifanio (INHS) are conducting a project to re-establish viable populations of *L. miniatus* in its historic range in the Illinois River basin with offspring from the most genetically appropriate source population. Beginning in 2004, staff from the IDNR and INHS performed a status survey and DNA analysis of the redspotted sunfish in Illinois and boundary waters. After analyzing those data, the researchers began propagating the fish. Every year from 2008–2010, adult, pre-spawned redspotted sunfish were collected in the spring and transported to propagation facilities at either the Illinois Natural History Survey or the Illinois Department of Natural Resources. In the fall of those years, adults were returned to the source location and juveniles were translocated to the Emiquon National Wildlife Refuge. This project will result in several self-sustaining populations, aiding in the removal of the species from the list of Illinois endangered and threatened species.

Young of year sunfish in propagation pond

Preparing tube for genetics study

Adult redspotted sunfish

Birds

Birds are possibly the most prominent group of vertebrates in the public consciousness. They have also long been a major focus of conservation activism. When new transportation projects are proposed, the public will often pay close attention to potential effects on avian populations.

During the planning phase of each survey, we consult the IDNR Natural Heritage Database, *The Illinois Breeding Bird Atlas*, the Illinois Annual Spring Count Database, the National Audubon Society Christmas Count Database, and the North American Breeding Bird Survey to assess the potential for bird species to occur in a given project area. We then assess the habitat available in the project area for special target species (endangered and threatened species or watch-list species). Habitat assessments are based on literature and the groups' collective experience. We select sites in representative habitat for these target species and for bird

The Rose-breasted Grossbeak (*Pheucticus lucovicianus*), a Neotropical migrant

communities in general in each project area. Ten-minute point counts are the survey method used most often. During these counts, the observer records all individual birds seen or heard within 165 ft. (50 m) of the census point. For shy species, we use playback assisted point counts. During these counts, the mating calls of the target species are broadcast over the habitat from a speaker to draw the birds out. In linear habitats such as roads and train rights-of-way, we walk or drive transects, stopping to note all birds seen or heard at pre-determined intervals. For EIS projects, censuses are conducted twice during each of 3 major periods in the avian life cycle: spring migration, breeding, and fall migration. These periods characterize major annual changes in the diversity of bird populations in Illinois. For other projects a single-season assessment is sufficient (e.g., winter Bald Eagle assessments or assessments of a specific breeding location for endangered or threatened birds).

Many species of songbirds that occur in the Midwest (passing through or breeding) are Neotropical migrants that spend most of the year in subtropical or tropical latitudes and are in Illinois only during the breeding season. These species are generally area-sensitive, requiring some critical amount of habitat to breed, and their preservation is a topic of concern for conservation groups and governmental entities. Hawks, owls, waterfowl, and other game species, are also of special concern to conservation groups and the general public. Finally, forest interior species, which have been

The Least Bittern (*Ixobrychus exilis*), a secretive Illinois endangered species

shown to be a group in decline, are of particular concern. The group Partners in Flight (http://www.partnersinflight.org/), a working group of North American avian ecologists, has developed a list of species of concern for specific geo-ecological regions of North America. Other groups, The American Bird Conservancy and the National Audubon Society, have built on this ranking approach to generate The US Watch List for Birds. IDNR used these lists, as well as specific local concerns, to produce a list of Bird Species in Greatest Need of Conservation for Illinois presented in The Illinois Comprehensive Wildlife Action Plan.

For each project, we document the historical and current occupancy of bird species designated as federally listed, state-listed, or Illinois species in need of conservation. We also provide information on Neotropical migrants, species defined as forest interior dwellers, waterfowl and other game species, raptors or birds of prey, and bald eagles. Surveys are designed to provide data required by federal and state statutes and regulations (i.e., The Migratory Bird Act, National Environmental Protection Act, the Bald and Golden Eagle Protection Act, and the Clean Water Act).

Avian Research

Dr. Wendy Schelsky's research focuses on how extra-pair mating opportunities differentially influence breeding and dispersal decisions of the sexes in the Prothonotary Warbler (*Protonotaria citrea*), a socially monogamous songbird in illinois. Her research shows that male warblers monitored the success of neighboring nests that contained their extra-pair offspring whereas females sought out extra-pair fertilization from males that were less related than their social mates, suggesting that small songbrids have sophisticated ways of enhancing their reproductive success.

Wendy Schelsky conducts a point count at the LaGrange Wetland Banking Site

Bald Eagle Recovery in Illinois

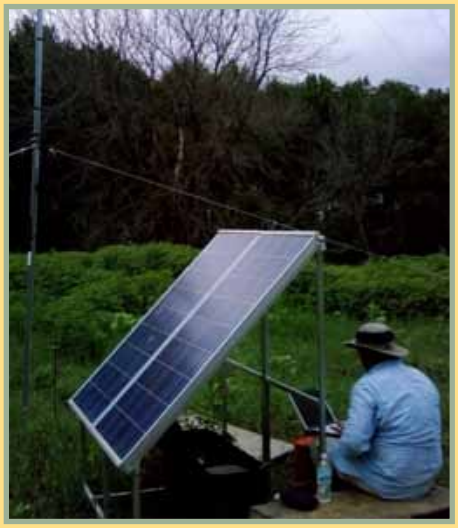
Bald Eagles (*Haliaeetus leucocephalus*) are one of the species that we pay particular attention to during IDOT avian assessments. The Bald Eagle has a special place in America as our official national symbol. However, in the early 1970s the species was in grave trouble.

It is not clear how abundant Bald Eagles were in Illinois prior to European settlement, but early explorers describe it as a common breeding bird and as 'extremely abundant' on the big rivers of Illinois in the winter. The extinction of Bald Eagles was considered a real possibility by 1940. Harassment by humans, including bounties in several states, and habitat loss had decimated the population. The Bald Eagle Protection Act of 1940 was enacted by Congress in an attempt to end the wholesale slaughter. However, with the post-WWII introduction of DDT and its relatives onto the landscape, the Bald Eagle continued its precipitous decline. By 1963 the breeding population in the lower 48 states was estimated to be fewer than 500 pairs. The Endangered Species Preservation Act of 1966 and the Endangered Species Act of 1973 laid further ground work for Bald Eagle recovery, and in part because of its status as our national symbol the Bald Eagle became a focus of the environmental movement. Major Bald Eagle habitat conservation efforts were undertaken in Illinois by the IDNR and the Illinois Audubon Society, with innovative habitat protection and monitoring programs. Still, in 1985 only a single breeding pair of Bald Eagles survived in Illinois and the over wintering population on the Mississippi and Illinois rivers had dropped well below 600.

Bald Eagle recovery is now one of the success stories of endangered species protection. Between 1963 and 2007, the number of breeding pairs in the lower 48 states increased from ~ 487 to over 11,000, and in 2007 the Bald Eagle was removed from the US threatened and endangered species list. The bird was delisted in Illinois in 2009. Wintering populations on the rivers of Illinois now average a few thousand annually and it is estimated that 30 to 40 pairs of Bald Eagle currently nest in Illinois. Federal protection for the Bald Eagle is still strong in the guise of the Bald and Golden Eagle Protection Act and we will continue to monitor Bald Eagle activity near all IDOT projects.

Bald Eagles in late winter along the Illinois River

Dr. David Enstrom has been working with a variety of audio recording devices to assess the effects of traffic noise on vocal wildlife species (birds, amphibians, and insects). He is currently nearing the end of a 4-year study of the effects of traffic on a rail line through the counties surrounding Chicago. The study is examining the loudness of various traffic noise sources (trains, planes, and cars) using audio location. He is specifically examining potential changes in the vocal behavior of animals due to the passing of trains.
This is part of a larger INHS study of the effect of increased train traffic on natural areas.



David Enstrom programing an audio grid in DuPage County

Dr. Kevin Johnson is the world's foremost authority on the relationship between birds and their ectoparasites. His research covers a wide range of topics, from bird conservation to feathers, dinosaurs, and feather parasites. His recent work on Passenger Pigeon (*Ectopistes migratorius*) genetics was featured in a press release by the University of Illinois and covered by a variety of news agencies. In 2011, Dr. Johnson published 10 articles in peer-reviewed journals.

Kevin Johnson with a mount of the extinct Passenger Pigeon

Mammals

Mammals also hold a high place in the public consciousness and are a major focus of conservation activism. As with birds, the public pays close attention to the potential impacts of IDOT projects on mammals.

Our surveys provide an assesment of the mammalian fauna in the project areas as required by federal and state statutes and regulations. We survey specifically for federally and state-endangered species. We use historical data (e.g., IDNR Natural Heritage Database, museum specimens) to help determine which species may be present in a given project area. Field surveys of mammals are conducted through capture-and-release programs using a variety of live traps and mist nets appropriate for the target species.

The focus of many of our surveys is the federally and state-endangered Indiana bat (*Myotis sodalis*). This rare species is small (~ 8 g) and spends summer days roosting beneath slabs of loose, peeling bark on dead trees or the "shaggy" bark of certain live trees. Surveys to determine the Indiana bat's presence involve mist netting at night and follow protocols described by the U.S. Fish and Wildlife Service. Mist-netting sites are established in areas that we determine to be suitable habitat for Indiana bats, based on the presence of potential roost trees. At each site, 2 sets of black nylon mist nets are suspended over a likely flyway for bats, most often a stream or small river. The nets are opened at dusk and monitored continuously for the first 30 minutes of netting. They are then checked every 10 minutes over the course of the next 5 hours. The reproductive state, age class, weight, and overall condition of each captured bat are determined and the animals are released at the point of capture.

A young Franklin's ground squirrel

Franklin's ground squirrel (*Poliocitellus franklinii*), listed as a threatened species in Illinois in 2009, is also a major focus of our surveys for IDOT in northern and central Illinois. This animal spends most of its life underground. It is a true hibernator and only active aboveground during the summer. These ground squirrels have fairly restrictive habitat requirements (areas with vegetation that is not regularly mowed and moderately to well- drained soil). Therefore, the first step in a Franklin's ground squirrel survey is to identify habitat patches in the project area that might support them. We perform the assessment by visiting the project area to look at the vegetation and consulting Natural Resource Conservation Service soil maps. We then use live traps, laid out in lines or grids, to determine the presence or absence of Franklin's ground squirrels in these patches. Traps are baited with popcorn and set in the morning (because the animal is diurnal). They are checked in early afternoon and again in late afternoon. Trapping continues for 3 consecutive days. The reproductive status and weight of each captured ground squirrel are recorded, and a small patch of fur on the animal's side is clipped. This allows us to recognize any animals that are trapped again and determine the number of individuals caught at the trapping site. The ground squirrels are then released at the trap location.

Joe Merritt and Jean Mengelkoch collect data during roadside trapping

Two other state-threatened rodents, the marsh rice rat (*Oryzomys palustris*) and golden mouse (*Ochrotomys nuttalli*), are the focus of surveys in southern Illinois. The rice rat is primarily a resident of wetland habitats, whereas the golden mouse occupies wooded or shrubby areas. After identifying suitable habitat for one or both species during visits to the project area, trap lines or grids are established. Sherman live traps are baited with a mixture of rolled oats and peanut butter. Traps for rice rats are placed near water; some of the traps for golden mice are placed aboveground in shrubs or masses of vines because the species is largely arboreal. Traps are set during late afternoon and checked for 3 consecutive mornings. As in Franklin's ground squirrel surveys, each captured animal's reproductive condition is determined and it is marked and released.

Mammalian Research

Jean Mengelkoch's research involves the identification of bats that have been tested for rabies in Illinois; data are provided to the Illinois Department of Public Health. Jean is also a Councilor-at-Large for the Illinois State Academy of Science and judged student posters and presentations at its annual meeting.

Joe Merritt demonstrates proper handling of small mammals to students

Dr. Joseph Merritt is a physiological ecologist and functional morphologist specializing in adaptations of mammals to cold. He is currently working on a surveillance project for white-nose syndrome in Illinois bats. Joe has recently published *Guide to the Mammals of Pennsylvania, The Biology of Small Mammals,* and coauthored the college textbook *Mammalogy: Adaptation, Diversity, Ecology*. He also teaches short field courses in mammalogy.

Plants

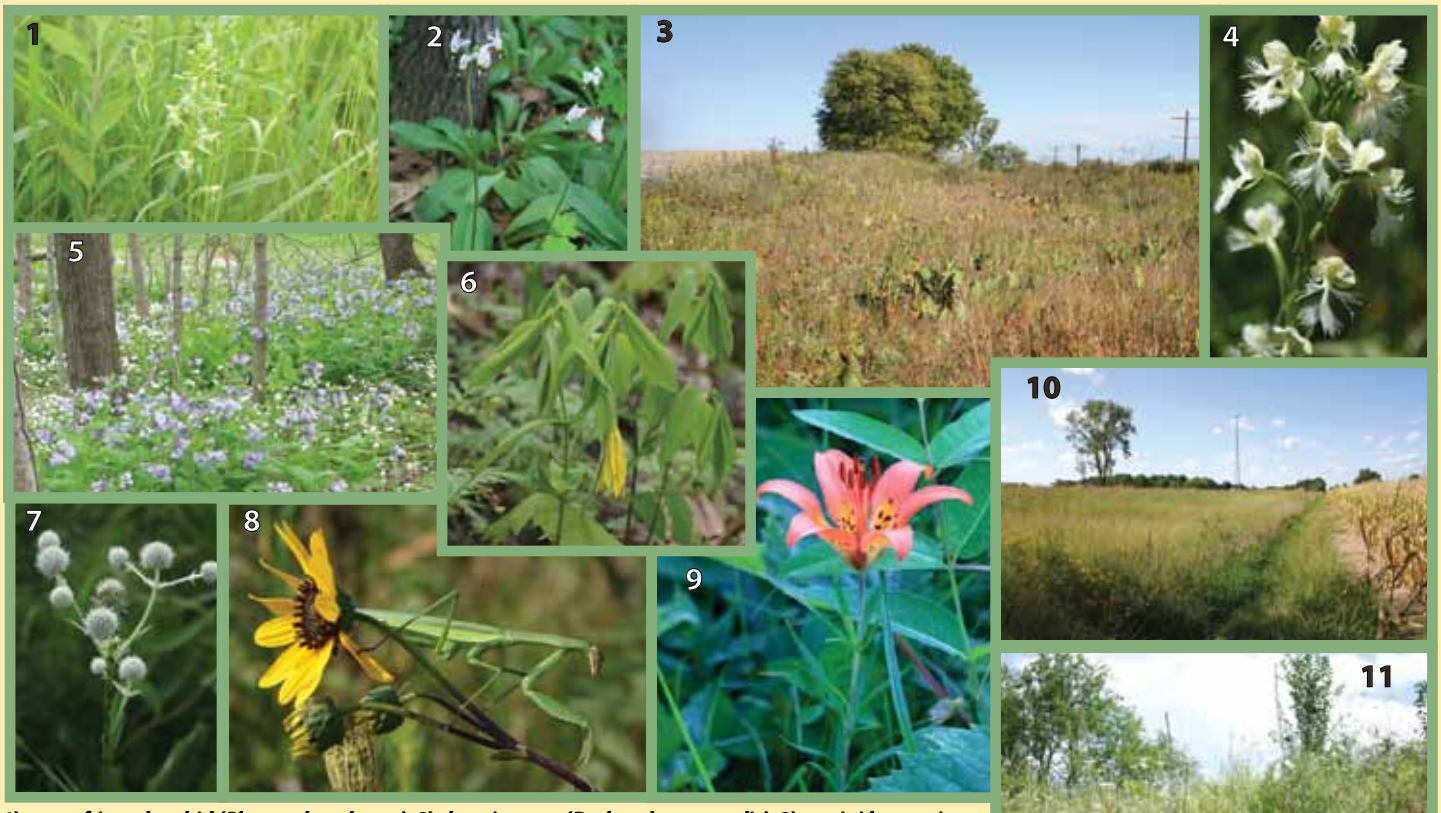
The 4 full-time botanists in the Biological Surveys Program conduct botanical surveys within IDOT project areas throughout Illinois, evaluating thousands of acres for rare and/or unique botanical resources. Individual project areas can range in size from only a few acres to tens-of-thousands of acres that span several counties, and commonly encompass numerous native vegetation types in a variety of habitat conditions.

Two primary objectives of the botanical surveys are to search for species listed as threatened or endangered by the Illinois Endangered Species Protection Board and identify natural areas with remnant vegetation types that retain composition and structure similar to pre-European settlement conditions. Natural communities such as these often harbor many of the state's rarest plant species. Our surveys have contributed many new records of threatened and endangered species and high-quality natural communities throughout the state. These communities can range from wetlands, such as calcareous seeps, bottomland forests, and marshes, to dry upland habitats such as woodlands, prairies, and cliffs.

Habitats in IDOT project areas typically are characterized regardless of condition, but when native plant communities are found that possess noteworthy remnant quality, detailed surveys often are conducted. Data collection includes acquisition of GPS coordinates for mapping applications, compilation of thorough species lists for each vegetation type, and collection of selected plant specimens for documentation.

Our surveys on behalf of IDOT allow the growth and maintenance of our transportation infrastructure to proceed in a way that helps ensure that many of our most irreplaceable natural resources are preserved for future generations.

Botany field equipment: 1) hand pruners, 2) pruning saw, 3) machete, 4) tree diameter measuring tape, 5) plant press, 6) journal, 7) compass, 8) magnifying lens, 9) binoculars, 10) GPS unit, and 11) Japanese digging knife.



1) green fringed orchid (*Plantanthera lacera*) 2) shooting star (*Dodecatheon meadia*) 3) mesic/dry-mesic prairie remnant 4) prairie fringed orchid (*Plantanthera leucophaea*) 5)mesic floodplain forest with bluebells (*Mertensia virginica*) and false rue anemone (*Isopyrum biternatum*) 6) bellwort (*Uvularia grandiflora*) 7) rattlesnake master (*Eryngium yuccifolium*) 8) prairie sunflower (*Helianthus rigidus*) with Chinese Mantis (*Tenodera sinensis*) 9) prairie lily (*Lilium philadelphicum var. andinum*) 10) dry-mesic prairie remnant 11) dry gravel prairie remnant

US Route 51 Environmental Surveys 2008–2011By the Numbers

U.S. Route 51 Lane Expansion and Upgrade:

The U.S. Route 51 lane expansion and upgrade from south of Pana, IL to Centralia, IL, has been an ongoing IDOT project associated with the expansion of approximately 75 miles of remaining 2-lane highway from Moweaqua to Centralia, to 4 lanes. The U.S. Route 51 surveys began in 2008 and continued into 2009 as part of an EIS (Environmental Impact Statement) project. Surveys extended into 2010 and 2011 with the addition of 2 addenda. During its first year, this project encompassed approximately 48,000 acres, occurring in 6 counties to accommodate bypasses where segments of the new 4-lane highway would be routed around Ramsey, Vandalia, Mt. Vernon, Patoka, Sandoval, Junction City, and Centralia.

Shifts in the regional locations under consideration for the construction of bypass segments have resulted in the addition of thousands of acres of new areas to be surveyed in consecutive years. In total, nearly 70,000 acres occurring in seven counties underwent preliminary and/or intensive evaluation by scientists within the botany section.

As with nearly all botanical surveys conducted within IDOT project areas, the U.S. Route 51 surveys led to numerous new and interesting botanical discoveries, some of which are here highlighted.

Mussels

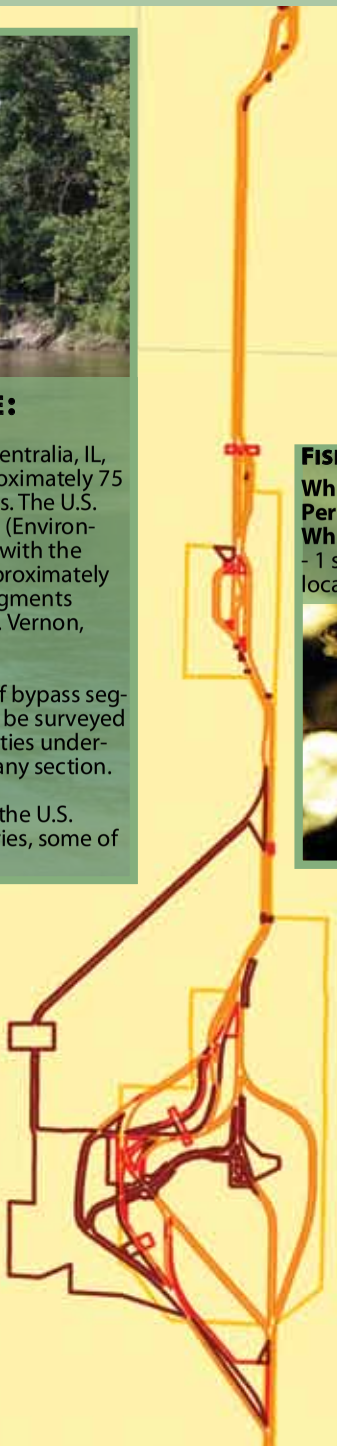
Who: Jeremy Tiemann, Kevin Cummings, and 1 other
Person Days: About 18
What we found: 15 species from hundreds of individuals captured

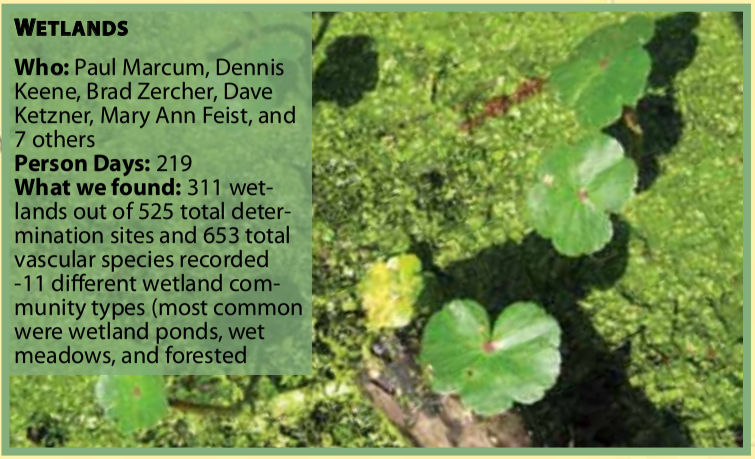
Fishes

Who: Chris Taylor, Jeremy Tiemann, and 4 others
Person days: About 20
What we found: About 50 species from thousands of individuals captured
- 1 state endangered species (western sand darter (*Ammocrypta clarum*)) was found at 2 locations in the Kaskaskia River

Herps

Who: Andy Kuhns, 6 others helped with field work, 4 others provided location information
Person Days: About 20 all in 2008-9
What we found: 21 species comprised of 11 Amphibians and 10 Reptiles





Wetlands

Who: Paul Marcum, Dennis Keene, Brad Zercher, Dave Ketzner, Mary Ann Feist, and 7 others
Person Days: 219
What we found: 311 wetlands out of 525 total determination sites and 653 total vascular species recorded
-11 different wetland community types (most common were wetland ponds, wet meadows, and forested

BOND

Habitat Assessment For Water Quality and Aquatic Macroinvertebrate Work

Who: Mark Wetzel, Steve Taylor, Kristi L. Moss, and Allan D. Yanahan
Person Days: 10
What we did: 53 sites were assessed for habitat and 31 sites chosen for surveys

Water Quality

Who: Mark Wetzel and Kristi L. Moss
Person Days: 20
What we did: 78 water quality monitoring events (usually 3 times/year at a site) were completed at 31 sites
- Water quality monitoring events include both the measurement of 9 field parameters at each stream site, and the collection of water samples for laboratory analyses (40 constituents, including metals, inorganic, and organic components).

Aquatic Macroinvertebrates

Who: Mark Wetzel, Steve Taylor, Kristi L. Moss, and Allan D. Yanahan
Person Days: 23
What we found: 16,816 individuals were collected covering many species
- many new county distributional records for aquatic macroinvertebrates (excluding unionid mussels) established from collected specimens
-2 new state records: 1 earthworm (*Murchieona muldali)*, introduced, rare in North America (few localities in Indiana, Michigan, and Tennessee) and 1 aquatic worm (*Tasserkidrilus superiorensis*), limited distribution mostly in the Great Lakes region

Botanical Surveys

Who: Mike Murphy and 6 others
Person Days: between 180-200
What we did: surveyed 150-200 sites covering 30,000 – 40,000 acres
-included about 500 acres of forest
What we found: not all specimens have been fully processed
-New county records: 2 to 4 dozen
-Range extensions: about a dozen
-Total species found: 850 to 1,000
-1 state endangered heart-leaved plantain (*Plantago cordata*)

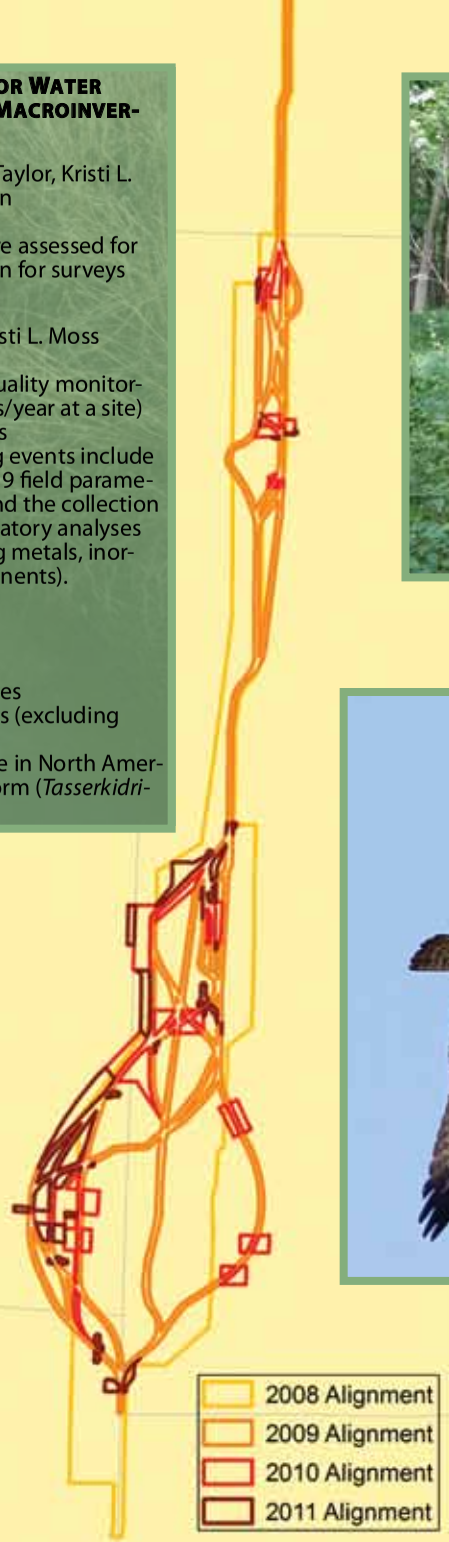
CLINTON

Mammals

Who: Joyce E. Hofmann, Joseph F. Merritt, Jean M. Mengelkoch
Person days: 58
What we found: Captured 18 red bats (*Lasiurus borealis*), 3 eastern pipistrelles (*Pipistrellus subflavus*), 3 big brown bats (*Eptesicus fuscus*), and 5 evening bats (*Nycticeius humeralis*)
- Another 13 mammal species were observed by INHS personnel

Birds

Who: Dave Enstrom
Person Days: 35
What we found: 132 species
- 2 Illinois Endangered Species were seen in the study area, both during migration: Osprey and Northern Harrier
-34 species regarded as species of concern or watch-list species were found during the censuses
-26 species by the Illinois Wildlife Protection Plan as "Watch-list" species were seen in the area
- 7 species listed by Partner's in Flight as species of concern
- 1 additional species listed on the Audubon Society Watch-list
-27 of these watch-list or species of concern were found to breed in the study area
-34 neo-tropical migrant species were found to breed in the area



JEFFERSON

Person day:

1 person in the field for 1 day; excludes all work done in the office or lab

The Eastern Richmond Bypass Botanical Surveys

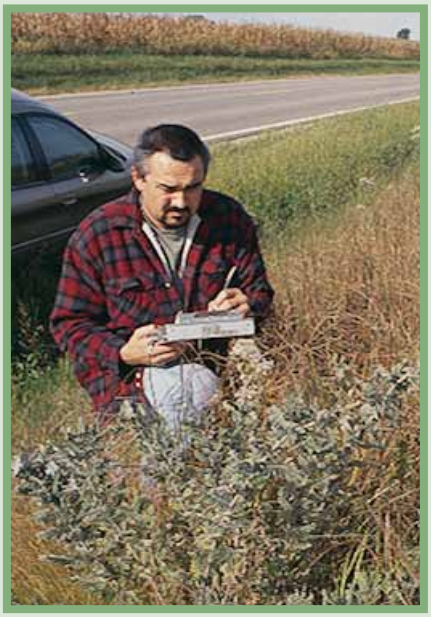
Bottle gentian (*Gentiana andrewsii*) is an indicator of a higher-quality habitat remnant

A botanical survey of the Eastern Richmond Bypass study area in 2011 encompassed approximately 2,200 acres. This survey identified all land cover-types present, calculated total acreage represented by each, determined if any high-quality natural vegetation communities occurred within this area, and searched for threatened or endangered vascular plant species that may persist there.

Some of the most interesting areas found during this survey were several highly diverse wetlands along the southern limits of the project area, which included seeps, swamps, sedge meadows, and calcareous fens. The highest-quality area found during botanical surveys occurred along the south side of Nippersink Creek, an intergrading mosaic of sedge meadow and calcareous fen with 90 vascular plant species (93.3% native). Many species found here were noteworthy indicator species — species found only in remnants of their native habitats, and included fringed brome (*Bromus ciliatus*), sweet Indian plantain (*Cacalia suaveolens*), marsh bellflower (*Campanula uliginosa*), yellow lake sedge (*Carex utriculata*), fen thistle (*Cirsium muticum*), fen betony (*Pedicularis lanceolata*), and swamp saxifrage (*Saxifraga pensylvanica*).

The Eastern Richmond Bypass study area contained portions of the North Branch of Nippersink Creek and its tributaries, an Illinois Natural Areas Inventory site. Not only were there large fish, turtles, and an assemblage of noteworthy freshwater mussels in this creek, but along its banks and in its ponded areas were habitats of highly diverse terrestrial and aquatic vegetation. This portion of the project area had the highest diversity of plants, with a total of 124 species (approximately 80% native). Interesting aquatic species at this site included forked duckweed (*Lemna trisulca*), white water lily (*Nymphaea tuberosa*), yellow water lily (*Nuphar luteum ssp. macrophyllum*), white water buttercup (*Ranunculus longirostris*), and the carnivorous plant, bladderwort (*Utricularia vulgaris*), which obtains nutrients by capturing small aquatic organisms including insect larvae, crustaceans, and algae.

Statewide Roadside Prairie Inventory



Bill Handel recording species composition in a roadside prairie

Roadside remnants provide cover and dispersal corridors for prairie flora and fauna, and they are an invaluable source of seed of local ecotypes for habitat restoration projects. They provide refugia for species that have been eliminated from the nearby landscape and they sometimes link areas of higher quality prairies, allowing dispersal of species and genetic exchange between remnants. Because they are often linear in shape, they may cross several soil types and moisture gradients, creating communities of high diversity.

IDOT requested an inventory of roadside prairies during 2001–2003. Areas where roads and railroads run parallel often provide native prairies with protection from destruction. Thus, areas where roads ran parallel within 400 ft of an existing railroad were delineated on GIS maps. Surveys of these areas detected 325 prairie and savanna remnants, totaling 564 linear miles. In 2010, IDOT requested a follow-up to the original inventory to assess changes and provide more detailed information on the overall health and viability of roadside prairies in Illinois.

During 2010 and 2011, 4 of the 9 IDOT districts (5, 7, 8, and 9) were resurveyed by INHS botanist Bill Handel. Of the 325 original sites, 137 (42%) were reevaluated, and 5 new prairie remnants were located during surveys. Preliminary results show that many remnants have been lost to development, and others have become much more degraded since the original surveys.

Bird's-foot violet (*Viola pedata*) the most showy of Illinois' native violets, growing in a roadside prairie

Benefits of prairie remnants include potential reduction in the cost of roadside maintenance and increased control of erosion. Native prairie remnants can reduce the presence of exotic and noxious weeds along highway corridors. Prairie remnants provide habitat for game species such as Ring-necked Pheasant and Northern Bobwhite. Plantings to create habitat for these species typically consist of 1 or 2 prairie grass species. These plantings are inferior to native prairie remnants that provide not only cover, but also high concentrations of food from plant seeds and insects. In some areas where habitat has disappeared because of development or intensive agriculture, prairie remnants may be the only natural communities of any type that still persist.

Botanical Hotspots

When highway and bridge improvements are planned near botanical hotspots, there is a high likelihood of finding new records for threatened, endangered, and other rare species in adjoining habitats. The 2011 IDOT projects near Lake Michigan in Lake County, Starved Rock State Park along the upper Illinois River valley, and Mississippi Palisades State Park in the un-glaciated (driftless) region of northwestern Illinois discovered a number of hotspots.

Cliff goldenrod
(*Solidago sciaphila*)

Red-berried elder
(*Sambucus racemosa ssp pubens*)

Habitats associated with Starved Rock State Park

Many specialized habitats occur in and near Starved Rock State Park with its unique sandstone bedrock with cliffs and canyons that harbor numerous uncommon plants. Sandstone cliffs and forest habitats border the west side of the park along a highway with a planned bridge replacement over the Illinois River. Newly discovered threatened and endangered species adjacent to the highway include cliff goldenrod (*Solidago sciaphila*), a species largely restricted to un-glaciated portions of the upper Midwest, and red-berried elder (*Sambucus racemosa* ssp. *pubens*), a species related to the common elderberry.

Habitats near Lake Michigan

Many unique plant species occur in near-shore habitats along Lake Michigan in Illinois. Seven threatened and endangered species were found near a proposed highway improvement project near Waukegan, Illinois, including an orchid, 3 sedges, a rush species, bog arrow grass (*Triglochin palustris*), and purple-flowered raspberry (*Robus odoratus*). Surprisingly, several of these were found in areas associated with a former industrial site. Adaptation to alkaline or limey habitats, combined with tolerance to certain levels of disturbance, allowed these species to persist although the habitat has been degraded.

Tubercled orchid (*Platanthera flava var. herbiola*)
pictured with detail image

Bog arrow grass
(*Triglochin palustris*)

Purple-flowered raspberry
(*Rubus odoratus*)

Limestone bluff in Palisades State Park

Habitats associated with Mississippi Palisades State Park

A bridge replacement over the Mississippi River and realignment of an associated state highway occurred adjacent to Mississippi Palisades State Park with towering dolomite cliffs and deep ravines. This region is known for its rich botanical diversity including many rare species at the southern extent of their geographic range. Populations of some of these species, as well as high-quality habitats border the highway. Botanical surveys in the project area identified 2 populations of the state-threatened cliff goldenrod and 3 populations of the state -endangered Canada violet (*Viola canadensis*).

These findings add new data about the distribution and ecology of Illinois' botanical resources and provide information to IDOT to assist it in avoiding or minimizing impacts to populations of rare species, thus providing a key role in conserving biodiversity in Illinois.

Eastern Prairie Fringed Orchid Surveys

Eastern prairie fringed orchid in a remnant sedge meadow habitat in northeastern Illinois

Eastern prairie fringed orchid (*Plantanthera leucophaea*) is a federally threatened and Illinois endangered species. This orchid is a very rare perennial herb that grows from an underground tuber. It is found primarily in mesic to wet prairies, sedge meadows, and fen communities in northeastern Illinois, but was once a characteristic component of these habitats throughout much of the northern two-thirds of Illinois. Historically, this orchid was known to occur in at least 33 of the counties in Illinois. The historical distribution data are not comprehensive, and the number of Illinois counties in which the species once occurred is likely much higher. There are approximately 28 native populations of this species remaining within the state, occurring in only 8 counties.

This species is most easily identified during flowering time; therefore surveys should be conducted during the narrow window of peak flowering from the last week of June to the second week of July. The USFWS Chicago office has developed guidelines for evaluating eastern prairie fringed orchid habitat in northeastern Illinois. These guidelines include conducting surveys on 3 non-consecutive days between 28 June and 11 July. Additionally, a list of known plant associates and ecological indicators specific to Illinois is used to evaluate individual sites for potential habitat for the eastern prairie fringed orchid. Each year, INHS botanists participate in eastern fringed orchid surveys throughout the Chicago region and this species is carefully searched for whenever IDOT projects involve potential habitat.

Rock Elm Monitoring and Propagation

Rock elms (*Ulmus thomasii*) are widespread geographically but have declined in abundance because of their susceptibility to Dutch elm disease. A population of rock elms was discovered at Big Rock Creek, Kendall Co., during botanical surveys associated with the IDOT Prairie Parkland project in northeastern Illinois. Because runoff from construction activities associated with this project may affect these trees as the project moves forward, INHS botanist Steve Hill is monitoring this population and propagating new individuals from seed. If propagation is successful, new individuals will be planted at the Kendall County Forest Mitigation Site, a few miles south of the existing population.

Rock elms at Big Rock Creek, 16 May 2006

Rock elm seedling in the INHS greenhouse

Forty trees were mapped in 2011 at the Big Rock Creek site, but only 3 individuals produced substantial seeds that year. A few additional seeds were found on or beneath several other clusters of individuals, and seeds also were collected from a tree in Emmons Woods, a protected site downstream from the larger population. The Morton Arboretum also contributed seeds from one of their cultivated trees.

Germination success was very poor — of the nearly 800 seeds planted from all sources, only 47 seedlings survived. Several germination methods were attempted, but the 2 most successful were planting in pots outdoors in filtered sunlight, and planting on the surface of flats under a mister in a greenhouse with supplemental light.

First-year observations in this study showed poor germination rates, and for seeds that did germinate, rates of survival were also low. Seedlings that survived the first several months grew to a height of only 2 – 3 inches. They are currently being held an INHS greenhouse until spring, when survival will again be assessed. Another attempt will be made in the spring of 2012 to obtain more seeds and grow seedlings for transplantation.

New Discoveries Provide New Understanding of Illinois' Native Flora

Although primary objectives of botanical surveys in IDOT project areas include locating threatened and endangered plant species and/or high-quality remnant vegetation communities, often new findings are made that contribute greatly to our knowledge and understanding of the Illinois flora.

1) *Carex corrugata* (corrugated sedge) - until 2008, known only from a few southern IL counties bordering the Mississippi, Ohio, and Wabash rivers. During U.S. Route 51 surveys it was discovered in 20-30 additional sites in 4 additional counties in the central section of the state. Shown is an enlarged view of "puckered" perigynia (seed-sacs), which are a diagnostic feature of this species.

2) *Plantago cordata* (heart-leaved plantain) - a state endangered species, rare nearly throughout its entire North American range. A new population of this species was found in a habitat never before documented in Illinois, and in a region never before documented - the Southern Till Plain Natural Division.

3) *Carex missouriensis* (Missouri sedge) - a newly described species in 2001. Many new populations of this species were found during U.S. Route 51 surveys, occurring in higher-quality sedge meadows and wet prairies. Shown is an enlarged view of perigynia (seed-sacs) showing the long, pointed beaks, which are one of the diagnostic features of this species.

4) *Jeffersonia diphylla* (twinleaf) - although not listed as threatened or endangered in Illinois, this species is seldom seen. Three new populations of this species were found in the U.S. Route 51 study area, including a new county record.

Steve Hill with *Sphaeralcea bonariensis*, a Bolivean mallow

Botanical Research

Dr. Steven Hill is a recognized expert on the New World Malvaceae, the mallow or cotton family. He published a treatment on the Malvaceae in Illinois in the Illinois Natural History Survey Reports and has named 7 new species and subspecies in the family. In 2011, his treatment on the Malvaceae of California appeared in the new Jepson Manual of the Vascular Plants of California, and treatments for several genera are being finalized for the Flora of North America, Volume 6. He recently published a paper discussing 15 species of sedges in Illinois, 3 of which were reported for the first time for the state. Steve is currently Associate Editor for the botanical journal *Rhodora* and a regular speaker to local and regional botanical Societies.

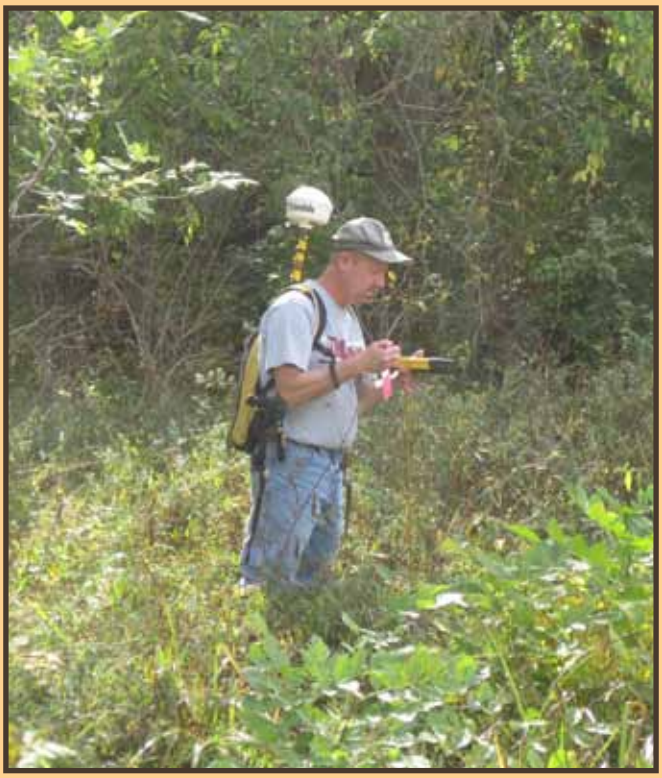
Dr. John Taft's research examines patterns of species and functional diversity in natural communities with a focus on oak woodlands and grasslands. His research on the development and testing of ecological indicators has implications for the identification of high-quality natural areas, the restoration potential of habitats, and the sustainability of diversity in fragmented landscapes. John serves on the Illinois Endangered Species Protection Board, in recognition of his 25 years of botanical surveys throughout the state with much of this experience coming from surveys conducted for IDOT.

John Taft and Danielle Ruffatto assesing habitat quality based on plant species composition

GIS AND GPS

Geographic Information Systems (GIS) and Global Positioning Systems (GPS) have become an invaluable asset to field research. GPS allow collection of accurate location data in the field by using information from satellites to calculate the position of the GPS receiver. Data collected from a GPS easily mesh with GIS software. In addition to generating maps of a study site, GIS can help researchers plan where to look for features. Preliminary maps can be created with datasets specific to a project area before field work is conducted. The GPS unit can then be set to guide researchers to the best sampling locations. GPS and GIS data also are easy to share with colleagues, allowing for greater collaboration.

The Wetland Science Program at INHS employs 3 GPS and GIS specialists with a collective 46 years of professional experience. Additionally, wetland field researchers are trained to use a GPS unit in the field. Prior to researchers going out to the field, a GIS specialist creates a field map showing wetlands identified by the National Wetland Inventory (NWI). This inventory was completed by the United States Fish and Wildlife Service using aerial photos from 1980 to 1988 to locate wetland areas. The NWI data show the locations and types of wetlands in the United States, and provide background information on the wetlands likely to be at an IDOT project area. In the field, a GPS is used to delineate any wetlands found in the project area. GPS data collected in the field are then post-processed using software specific to the type of GPS unit used. Post processing uses a network of fixed, ground-based GPS stations to improve the accuracy of the location information. Finally, report maps are created showing locations and boundaries of wetland features found in the field.



Wetland botanist Dave Ketzner collecting GPS data to delineate a wetland

The Biological Surveys Program employs 1 GIS specialist with 11 years of professional experience in GIS and remote sensing. Generation of maps and spatial data for the Biological Surveys Program is similar to that for the Wetlands Program with a few notable exceptions. Upon receiving a project assignment from IDOT, a search of the Natural Heritage Database is conducted to find any threatened and endangered species or high-quality natural areas within either 1 or 5 miles of the project area. This information is used to create a set of field maps for each of the disciplines (e.g., botany, mollusks, fish, etc.) assigned, as well as maps showing features meeting specific criteria (e.g., forest area). Each field researcher in the Biological Surveys Program is responsible for collecting GPS data for notable features found in the field. Field staff usually use small, handheld GPS units and collect points where notable features or species occur, as opposed to delineating entire areas. After a minimal amount of post processing, the GPS coordinates or a hand-drawn map of important field findings are delivered to the GIS specialist, and final report maps are created.

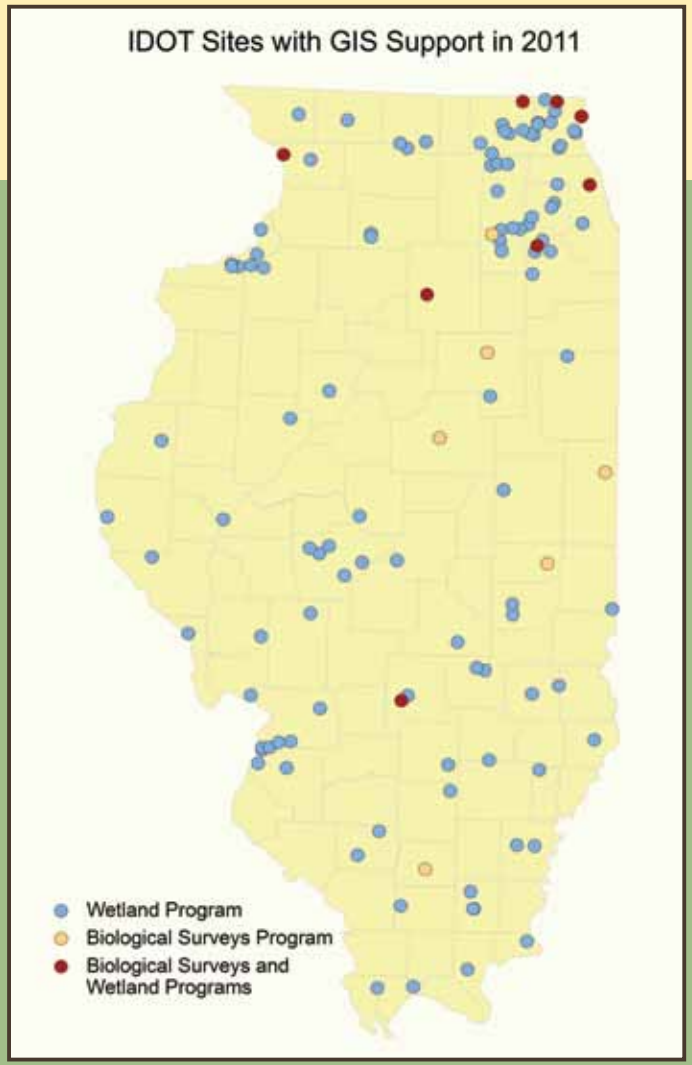
Biological Surveys botanist Bill Handel using a small, handheld GPS to record the location of a prairie remnant

When no GIS layer for the boundary of an IDOT project area is available, GIS specialists create the data for the project boundary based on maps included with the tasking information. GIS specialists in the Wetland and Biological Surveys Programs often work together closely. For example, when Biological Surveys field staff is requested to provide cover types for a project area, wetlands delineated by the Wetland staff are incorporated into the final cover type maps.

Natural Heritage Database

Beginning in 1986, the Illinois Department of Natural Resources' (IDNR) Division of Natural Heritage, in conjunction with The Nature Conservancy, established the Illinois Natural Heritage Database to be a central location for information on significant natural features within the state. The database houses information on 484 state and federally listed endangered and threatened species, 92 high-quality natural community types, and special features such as heron rookeries and large forest blocks.

The Natural Heritage Database has data compiled from a broad range of sources, including museum and herbarium collections, publications, the Illinois Natural Areas Inventory (INAI), and experts throughout the state. In addition, the database contains information on 660+ areas under protection by the Illinois Nature Preserve Commission's Nature Preserve and Land and Water Reserve programs. IDNR staff members, contractors, and volunteers perform field surveys to find and verify specific locations of the features of highest priority and to collect accurate information on the condition, quality, and management needs of these features. Information is easily accessible in manual, map, and computer files that are cross-referenced to provide a flexible data management system. The database is extensively used by the INHS IDOT programs to help focus the attention of field researchers on threatened or endangered species that may be present in project areas.



Threatened or endangered species observed in the course of field work are required to be reported to the Natural Heritage Database. The INHS IDOT programs support 1 person who is responsible for updating and maintaining the database, as well as replying to requests for data. In 2011, INHS staff working on IDOT projects reported 716 sightings of 72 threatened or endangered species to the Natural Heritage Database. These sightings included 518 invertebrates, 99 reptiles and amphibians, 50 plants, 42 fish, 5 mammals, and 2 birds.

In 2011, herpetologists working with the IDOT Biological Surveys Program reported observing Jefferson Salamanders (*Ambystoma jeffersonianum*) in Clark County. This state threatened species had not been reported in this area of the county before. The location and species information was added as a new record in the Natural Heritage Database.

Improved Map and Report Formats

In 2011, Wetland Science Program reports began including additional maps of background information on the sites. These additional maps show project locations, NWI wetland sites, and soil types. Advance Identification of Wetland Disposal Areas (ADID) locations for some northeastern Illinois counties are also included. This has nearly tripled the number of maps the wetlands GIS staff create for each report.

The wetland GIS staff created templates and line and text styles for wetland reports so there is consistency in all figures produced for reports regardless of which GIS specialist prepared them.
The wetland group has been working to compile all of their historic spatial data into a geodatabase. They have entered most of the data from 2002 to present. In the future, they plan to digitize data prior to 2002, which was before the implementation of GPS in the program.

The figure at left shows IDOT project locations for which maps were generated by the GIS group in 2011.

Support of the IDOT Programs by the INHS Collections

INHS collections provide invaluable insight into changes in species composition and distribution throughout Illinois over the past 150 years. Collections can aid in quantifying the impacts of habitat loss, environmental contamination, biological invasions, and global climate change on our native flora and fauna. The collections act as a biological library, allowing easy access to many years of data concerning the presence or absence of state listed species, which helps IDOT save time and money required for more extensive fieldwork. INHS oversees all aspects of collections management and maintenance of samples collected during IDOT biological surveys.

The INHS Fish Collection contains nearly 900,000 cataloged specimens

Many INHS vertebrate specimens are fixed in a formaldehyde solution and are currently stored long term in 70% ethanol either individually or as a lot. A specimen "lot" is a jar containing members of the same species collected at the same time at the same locale. Each specimen or lot of specimens is given a unique catalog number, which corresponds to a database containing species identification and locality data.

The Illinois Natural History Survey Amphibian and Reptile Collection contains approximately 21,000 cataloged specimens of which over 16,000 are from Illinois. The collection contains voucher specimens of 102 amphibian and reptile species from Illinois and over 550 species collected worldwide. In October 1997, the INHS took over curation and management of the University of Illinois Museum of Natural History (UIMNH) Amphibian and Reptile Collection. Combined they make up one of the largest reptile and amphibian collections in North America.

The Illinois Natural History Survey Mollusk Collection contains over 144,000 cataloged specimens, most of which were collected in Illinois and the southeastern United States. The collection is 90% freshwater species (mussels, fingernail clams, and snails) and 10% terrestrial species (snails).

A large part of the INHS Fish Collection comes from specimens collected from 1880 to 1905 for S.A. Forbes and R.E. Richardson's *The Fishes of Illinois* published in 1908 and from specimens collected from 1950 to 1978 for P.W. Smith's *The Fishes of Illinois*, published in 1979. The collection contains nearly 900,000 cataloged specimens (over 100,000 lots), which makes it the 15th largest collection of preserved fishes, and the 6th largest collection of Neotropical fishes in North America. Represented are about 170 families and over 2,500 species. The geographic scope of the collection is about 58% from Illinois, 28% from elsewhere in North America, 13% from South America, and 1% from the rest of the world, including Antarctica.

The INHS Crustacean Collection is one of the largest of its kind in North America. The collection contains about 89,600 specimens (over 11,000 lots) of approximately 325 species in 26 families. Almost all are from North America. About 50% of the collection is from Illinois; the remainder is mostly from the southeastern United States. The best represented groups are crayfishes, shrimps, scuds, slaters, and pill bugs. Specimens collected in the late 1800s by Stephen A. Forbes formed the basis for the first article to appear in the Survey's Bulletin, *List of Illinois Crustacea*. Additional specimens were added during the first half of the 1900s in conjunction with insect surveys organized by Herbert H. Ross. A large part of the collection also includes specimens collected from 1972 to 1982 for Lawrence M. Page's *The Crayfishes and Shrimps (Decapoda) of Illinois,* published in 1985.

Well-curated insect collections are crucial resources supporting bioinventory work (like that done for IDOT) as well as many other areas of entomology. In addition to the INHS Insect Collection's strong and comprehensive holdings of Illinois insects, material on several insect orders is global in scope. The collection is particularly rich in material gathered during the first two-thirds of the twentieth century. Today it houses more than 7,000,000 specimens, including about 14,000 types (specimens upon which new species descriptions have been based). Recently, the collection received several NSF grants for digitization projects. As a result, about 1,600,000 specimens are now included in the Insect Collection Database, which is available for search online from the Survey's web site. The data from the database are also shared with the Global Biodiversity Information Facility (GBIF).

Amy Bader sorting specimens in the INHS Insect Collection

The Illinois Natural History Survey Herbarium

The new herbarium houses >850,000 carefully preserved and catalogued specimens

The INHS herbarium houses and preserves collections of vascular plants, bryophytes (non-vascular plants e.g., mosses and liverworts), fungi, and algae. In 2011, the herbarium moved into the recently completed Robert A. Evers Laboratory, located on the south campus of the University of Illinois. This specially designed collections facility also houses University of Illinois' Plant Biology and Crop Evolution Laboratory collections. In total, there are over 850,000 specimens housed in this facility (>750,000 of which are vascular plants), making this combined collection about the 15th largest in the nation. Additionally, the INHS herbarium is one the most actively growing herbaria in the Midwest, with several thousand specimens added annually. Many of these specimens come from IDOT personnel – documenting new discoveries and findings within IDOT project areas.

The recently completed Robert A. Evers Laboratory, home of the new INHS herbarium plus several research labs

The INHS herbarium is an invaluable resource to INHS botanists in assessing past and current distributions of the Illinois flora, and in particular, those of threatened, endangered and rare species. It also serves as a vital tool in the accurate identification of species occurring in, and specimens collected from, IDOT project areas. Few scientific agencies have such an immense repository of data at their immediate disposal. This extensive resource uniquely positions the INHS to conduct exhaustive analyses of changes that have occurred in the Illinois flora over the last 150 years.

INHS botanists press plant specimens in the field to be later mounted and preserved in the herbarium laboratory

Thismia americana

Extinction - specimens provide evidence of what once existed. This species was last seen alive in 1916, in the Chicago area. This was the only population known in the world. The prairie habitat has since been destroyed.

Documentation - specimens provide verification of what species were present - where, in what habitats, and when. This baseline data is essential in tracking changes.

Exotic species - specimens help track the spread of exotic species. This specimen of annual loosestrife (*Lythrum hyssopifolia*) from a 2011 IDOT project area is the first record of this non-native species in Illinois.

Assessing the Rarest and Most Endangered of the Illinois Flora

Botanists at INHS help assess which plant species should be listed as threatened or endangered, and which species are now likely extirpated from Illinois. This process starts with contacting individuals who are most knowledgeable of the Illinois flora as well as searching for specimens of the historic Illinois flora in herbaria. The locations of present day and/or historic populations of rare species are identified as precisely as possible. Using this information, extensive field searches are conducted to relocate these populations and thoroughly document their current extent and distribution. IDOT has generously supported these efforts and information on > 400 species has been provided to the Illinois Endangered Species Protection Board to help determine the status of many rare species.

To assess the current status of a rare species such as American orpine (*Sedum telephioides*) (picture 1), researchers first examine herbarium specimens and historical records to ascertain where the species might occur in Illinois (picture 2, map 3), then conduct field surveys in appropriate habitat (picture 4).

2011 Milestones, Recognition, and Changes

- In 2011, INHS IDOT scientists published 35 peer-reviewed papers and authored or co-authored 37 presentations and posters at scientific conferences.
- Wendy Schelsky successfully defended her PhD dissertation.
- Mary Ann Feist successfully defended her PhD dissertation. Dr. Feist will be leaving the Wetland Science Program to start a postdoctoral position at the New York Botanical Gardens.
- Joe Merritt was elected Editor of the Journal of Mammalogy. JM is the primary publication of the American Society of Mammalogists, the premier scientific organization dedicated to the study of mammals, and was voted one of the 100 most influential serials in Biology and Medicine over the past 100 years by the Special Libraries Association.
- Kevin Johnson was elected a Fellow of the American Ornithological Union.
- Jeremy Tiemann served as President of the Illinois Chapter of the American Fisheries Society.
- Ed Heske served as President-elect of the American Society of Mammalogists.
- Mark Wetzel continued serving as Associate Editor of *Megadrilogica,* the journal of oligochaete (terrestrial annelid) biology.
- Steve Hill served as Associate Editor of the botanical journal *Rhodora*.
- John Taft and Ed Heske were elected to the List of Teachers Ranked as Excellent By Their Students for the courses they taught at the University of Illinois.
- Jeff Matthews was promoted to the new position of Wetland Science Research Leader in the Wetland Science Program.
- Brian Wilm and Scott Wiesbrook were promoted to the new positions of Assistant Project Leader for Botany (Wilm) and Assistant Project Leader for Soils (Wiesbrook), and have assumed new administrative and supervisory roles in the Wetland Science Program.
- Steve Taylor and Chris Taylor were promoted to the rank of Asst. Research Program Leader at INHS, and elected to the INHS Senior Management Team.
- Dan Wylie became the new manager of the INHS NIZ collections.
- George Geatz joined the Wetland Science Program as a new soil scientist.
- Laura Sass and graduate student Jordan Jessop joined the Wetland Science Program Research Group.

2011 Calendar Year - Technical Reports Submitted by the Wetland Program

Draheim, I., P. Marcum, J. Zylka and D. Skultety. 2011. Wetland delineation report: IL 47 (FAP 326) from US 14 to Charles Rd, McHenry County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (26): 1-120.

Draheim, I., B. Wilm and D. Skultety. 2011. Wetland delineation report: US 30 (FAP 575) Addendum A, from I-55 to IL 59, Will County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (75): 1-47.

Draheim, I., B. Wilm, S. Wiesbrook, J. Matthews and B. Zercher. 2011. Wetland mitigation monitoring report: FAU 5822 (Milan Beltway), Rock Island County – Rock Island Site. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (5): 1-42.

Draheim, I., B. Wilm, S. Wiesbrook and B. Zercher. Wetland delineation report: IL 26 (FAP 316), from Union Road to Easy Road, Lee County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (32): 1-21.

Draheim, I., B. Wilm and B. Zercher. 2011. Wetland delineation report: US 52/IL 64 (FAP 17) over Carroll Creek, Carroll County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (33): 1-21.

Draheim, I., B. Wilm and B. Zercher. 2011. Wetland delineation report: IL 26 (FAP316) south of Amboy Road, Lee County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (76): 1-22.

Draheim, I., J. Zylka, M. Feist and D. Skultety. 2011. Wetland delineation report: IL 176 (FAP 335) at Roberts Road, Lake and McHenry Counties, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (89): 1-20.

Draheim, I., J. Zylka and D. Skultety. 2011. Wetland delineation report: IL 171 (FAP 577) over Milne Creek, Add. A, Will County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (22): 1-12.

Feist, M. A. 2011. The Morris Wetland Bank: 2010 report and proposal for future monitoring. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (10): 1-8.

Feist, M. A., I. Draheim, J. Zylka, P. Marcum, J. Kurylo and B. Zercher. 2011. Wetland survey report for US Route 12 Bypass (FAP 334) [including Addenda A & B], McHenry County, Illinois and Walworth County, Wisconsin. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (1): 1-478.

Feist, M. A., G. Geatz and B. Zercher. 2011. Wetland delineation report: US 20 (FAP 301) Winnebago County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (101): 1-51.

Feist, M. A., J. Kurylo and B. Zercher. 2011. Wetland delineation report: Canton Bike Trail Addendum A, Fulton County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (39): 1-36.

Geatz, G., D. Ketzner, D. Skultety and B. Zercher. 2011. Wetland delineation report: Tunnel Hill Bike Trail Extension, Pulaski County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (87): 1-54.

Geatz, G., D. Ketzner and B. Zercher. 2011. Wetland delineation report: TR 91 (Malecki Road) over Horse Creek, Jefferson County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (81): 1-13.

Geatz, G., P. Marcum, V. Sivicek and B. Zercher. 2011. Wetland delineation report: IL 72 (FAP 341) Addendum C at Big Timber Road, Kane County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (104): 1-30.

Geatz, G., J. Matthews and D. Skultety. 2011. Wetland delineation report: FAU 3799 (River Road) over Blackberry Creek & Addendum A, Kendall County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (62): 1-18.

Geatz, G., S. Wiesbrook, J. Zylka and B. Zercher. 2011. Wetland delineation report: TR 13 (2850 North Road) over Mosquito Creek, Christian County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (56): 1-13.

Geatz, G., J. Zylka, I. Draheim and D. Skultety. 2011. Wetland delineation report: IL 140 (FAP 785) over a tributary to Silver Creek, Madison County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (91): 1-13.

Keene, D, D. Ketzner, P. Marcum, R. Larimore and B. Zercher. 2011. 2010 wetland mitigation monitoring report for Harrisburg Site 2, FAP 857 (IL 14), Fox River Bridge replacement: Saline County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (13): 1-42.

Keene, D, D. Ketzner and D. Skultety. 2011. Wetland report for IL 29 (FAS 2245), Bureau County. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (2): 1-14.

Keene, D, D. Ketzner and D. Skultety. 2011. Wetland delineation report: IL 72 at State St./ Getzelman Rd. (FAP 557), Kane County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (45): 1-12.

Keene, D, D. Ketzner and B. Zercher. 2011. Wetland delineation report: T.R. 272 over Richland Creek, Shelby County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (25): 1-9.

Keene, D, D. Ketzner and B. Zercher. 2011. Wetland delineation report: TR 251 over Taylor Creek, Greene County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (67): 1-14.

Keene, D, D. Ketzner and B. Zercher. 2011. Wetland delineation report: IL 52 (Columbine Ave), DuPage County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (70): 1-34.

Keene, D, D. Ketzner and B. Zercher. 2011. Wetland delineation report: Kennedy Road (FAS 566) over Elkhart Slough, Logan County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (73): 1-16.

Keene, D, D. Ketzner and B. Zercher. 2011. Wetland delineation report: Emmerson Airline Road (FAS 732), Macoupin County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (90): 1-31.

Ketzner, D., I. Draheim and D. Skultety. 2011. Wetland delineation report: Illinois Route 3 (FAP 788), Addendum # 1, St. Clair County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (95): 1-17.

Ketzner, D., I. Draheim and B. Zercher. 2011. Wetland delineation report: Illinois Route 3 (FAU 9166), from Hampden Avenue in Venice to 2nd Street in East St. Louis, Madison and St. Clair counties, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (108): 1-41.

Ketzner, D. and D. Keene. 2011. Site monitoring of the Fairmont City Wetland Compensation Site, St. Clair County, Illinois - 2010. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (11): 1-28.

Ketzner, D., D. Keene and D. Skultety. 2011. Wetland report for the Troy - O'Fallon Bike Trail, Madison and St. Clair counties, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (9): 1-93.

Ketzner, D., D. Keene and D. Skultety. 2011. Wetland report for FAP 788 (Illinois Route 3), north of St. Clair Avenue to Yellow Brick Road, St. Clair County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (44): 1-165.

Ketzner, D., D. Keene and D. Skultety. 2011. Wetland delineation report: Scott-Troy Bike Trail - Addendum, Madison and St. Clair counties, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (52): 1-22.

Ketzner, D., D. Keene, D. Skultety and B. Zercher. 2011. Wetland delineation report: TR 297 (River Road) over Johns Branch, Marion County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (35): 1-18.

Ketzner, D., D. Keene and B. Zercher. 2011. Wetland delineation report: South Stanford Road (TR 212A) over Raccoon Creek, Clay County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (99): 1-27.

Ketzner, D., J. Kurylo, P. Marcum and B. Zercher. 2011. Wetland delineation report: U.S. Route 12/Illinois Route 59 (FAP 334) at Sullivan Lake Road/Molidor Road, Lake County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (59): 1-27.

Ketzner, D., S. Wiesbrook, B. Wilm and B. Zercher. 2011. Wetland delineation report: Illinois Route 1 (SBI 140) over a tributary to Rock Creek, Hardin County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (51): 1-23.

Kurylo, J., M. A. Feist and B. Zercher. 2001. Wetland delineation report: CH 4 (FAS 680) from FAS 678 to the Indiana State Line in Edgar County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (107): 1-63.

Kurylo, J., D. Ketzner, P. Marcum, D. Szafoni and D. Skultety. 2011. Wetland delineation report: IL 47 (FAP 326) from Reed Road to US 14 - Addendum A McHenry County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (58): 1-119.

Kurylo, J., D. Ketzner, V. Sivicek and B. Zercher. 2011. Wetland delineation report: IL 3 (FAU 8956) from Stanka Road to Piasa Creek in Madison County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (97): 1-19.

Kurylo, J., P. Marcum and D. Ketzner. 2011. Amendment for Corps of Engineers Site Challenge for TR 218 over Brushy Fork in Douglas County. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (18): 1-9.

Kurylo, J., P. Marcum, D. Skultety and Scott Weisebrook. 2011. Wetland delineation report: IL 1 (FAP 332) over the Embarras River in Lawrence County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (93): 1-45.

Kurylo, J., J. Matthews, J. Zylka, B. Wilm and B. Zercher. 2011. Wetland mitigation monitoring report for the FAP 301 (US 20 – Freeport bypass) site near the Jane Addams Trail (ISGS Site 6W), Stephenson County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (3): 1-29.

Kurylo, J., V. Sivicek and D. Skultety. 2011. Wetland delineation report: IL 178 (FAS 1279) over the Illinois River in LaSalle County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (83): 1-52.

Kurylo, J., B. Wilm and B. Zercher. 2011. Wetland mitigation monitoring report for Green Creek Mitigation Site in Effingham County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (6): 1-25.

Kurylo, J., B. Wilm and B. Zercher. 2011. Wetland delineation report: CH 9 (CR 870) over Kickapoo Creek in Coles County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (82): 1-18.

Kurylo, J., J. Zylka, D. Skultety and G. Geatz. 2011. Wetland delineation report: IL 47 (FAP 326) from IL 71 to Caton Farm Road in Kendall County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (68): 1-32.

Kurylo, J., J. Zylka, B. Zercher and G. Geatz. 2011. Wetland delineation report: US 30 (FAP 349) – Addendum D, Kane County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (53): 1-22.

Kurylo, J., J. Zylka, B. Zercher and G. Geatz. 2011. Wetland delineation report: US 30 (FAP 349) – Addendum E, Kendall County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (54): 1-20.

Larimore, R., D. Ketzner, P. Marcum, D. Keene and D. Skultety. 2011. Wetland mitigation and enhancement, FAP 332 (US 45), Saline County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (8): 1-26.

Larimore, R., A. Plocher and P. Marcum. 2011. Mitigation monitoring - Eckmann Site/Multi-Use Wetland Compensation, Madison County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (16): 1-22.

Marcum, P. B., I. Draheim, J. Zylka and D. P. Skultety. 2011. Wetland delineation report: Illinois 31 (FAU 336), original, Addendum A, B, and C, Bull Valley Road to Illinois 176, McHenry County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (57): 1-203.

Marcum, P. B., D. J. Keene, D. M. Ketzner and B. Zercher. 2011. Seventh year wetland mitigation site monitoring for the Tamms Site, FAS 1907 (IL 127), Alexander County, Illinois – 2010. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (4): 1-59.

Marcum, P. B., D. J. Keene, B. Zercher, D. L. Szafoni, D. M. Ketzner and D. P. Skultety. 2011. Wetland delineation report: I-70 (FAI 70) over the Kaskaskia River, Fayette County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (79): 1-41.

Marcum, P. B., J. Kurylo, D. M. Ketzner and D. P. Skultety. 2011. Wetland delineation report: IL 137 (FAP 352) at IL 137 (Greenwood Avenue), Lake County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (40): 1-65.

Marcum, P. B., J. Kurylo, D. M. Ketzner and D. P. Skultety. 2011. Wetland delineation report: IL 173 (FAP 303) at Sequoit Creek, Lake County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (50): 1-45.

Marcum, P. B., J. Kurylo and J. Zylka. 2011. Fourth year wetland mitigation site monitoring for the Pyramid Site EC25 (FAS 864 [Pyatt's Blacktop]), Perry County, Illiois – 2010. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (12): 1-33.

Matthews, J., I. Draheim, G. Geatz, S. Wiesbrook and D. Skultety. 2011. Wetland delineation report: IL Route 173 from IL Route 59 to US Route 41, Lake County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (102): 1-386.

Matthews, J., G. Geatz and B. Zercher. 2011. Wetland delineation report: Elgin-O'Hare Expressway, Addendum C, Cook and DuPage Counties, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (65): 1-78.

Matthews, J., J. Kurylo and D. Skultety. 2011. Wetland delineation report: FAS 556 (CH 4) over Buckhart Creek, Sangamon County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (21): 1-22.

Matthews, J., J. Kurylo and D. Skultety. 2011. Wetland delineation report: FAS 132 (Old Route 45) over a tributary to Langan Creek, Iroquois County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (85): 1-23.

Matthews, J., J. Kurylo and B. Zercher. 2011. TR 197 (Old Salem Lane) over Archer Creek, Sangamon County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (23): 1-29.

Plocher, A., I. Draheim and B. Zercher. 2011. Wetland delineation report: US 6 (FAS 226), I-80 to Edwards Road, Henry County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (34): 1-31.

Plocher, A., I. Draheim and B. Zercher. 2011. Wetland delineation report: North Branch Trail Extension, Cook County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (74): 1-41.

Plocher, A., G. Geatz, D. Keene and B. Zercher. 2011. Wetland delineation report: US 41 at IL 176, Addendum B (FAP 346 at FAU 1238), Lake County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (92): 1-66.

Plocher, A., D. Keene, I. Draheim, D. Ketzner and B. Zercher. 2011. Wetland delineation report: IL 22 (FAP 337) - Addendum C, Lake County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (78): 1-84.

Plocher, A., D. Keene and D. Ketzner. 2011. Wetland delineation report: B-9/EW-1, Cook County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (37): 1-29.

Plocher, A., D. Keene, D. Ketzner and B. Zercher. 2011. Wetland delineation report: I-80 (FAI 80), Rock Island and Henry Counties, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (100): 1-78.

Plocher, A., S.M. Wiesbrook, D. Keene, D. Ketzner, P. Marcum, D. Skultety and B. Zercher. 2011. Wetland delineation report: I-57 and Addenda A and B (FAI 57), Will County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (80): 1-124.

Plocher, A., S. Wiesbrook and D. Skultety. 2011. Wetland delineation report: IL 53 (FAP 870), DuPage County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (29): 1-12.

Sivicek, V., I. Draheim, G. Geatz, B. Wilm and D. Skultety. 2011. Wetland delineation report: Illinois Route 64 (FAP 307) at Illinois Route 47, Kane County, Illinois. Addendum B. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (30): 1-51.

Sivicek, V., I. Draheim and D. Skultety. 2011. Wetland delineation report: County Road 2200 East (FAS 351) over Indian Creek, Livingston County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (61): 1-18.

Sivicek, V., I. Draheim and D. Skultety. 2011. Wetland delineation report: Illinois Route 176 (FAP 335) at Nish Road, McHenry County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (66): 1-22.

Sivicek, V., I. Draheim, J. Zylka and B. Zercher. 2011. Wetland report for Illinois Route 161 (FAP 805) over Crooked Creek, Clinton County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (7): 1-45.

Sivicek, V., G. Geatz, P. Marcum and B. Zercher. 2011. Wetland delineation report: Illinois Route 132 (FAP 541), Munn Road to Sand Lake Road, Lake County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (111): 1-50.

Sivicek, V., G. Geatz and D. Szafoni. 2011. Wetland delineation report: United States Route 20 (FAP 525) at Harmony Road, McHenry County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (55): 1-44.

Sivicek, V., J. Kurylo and D. Skultety. 2011. Wetland delineation report: Evergreen Avenue and Water Street, United States Route 45 (FAP 328) to United States Route 40 (FAS 1707), Effingham County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (105): 1-65.

Sivicek, V., J. Kurylo and B. Zercher. 2011. Wetland delineation report: Illinois Route 120 (FAP 333) at Hainesville Road, Lake County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (103): 1-34.

Skultety, D., I. Draheim and B. Wilm. 2011. Wetland delineation report: TR62 over Johnson Creek, Edwards County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (84): 1-15.

Skultety, D., I. Draheim and J. Zylka. 2011. Wetland delineation report: US 34 (FAP 311) at CN Railroad, DuPage County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (19): 1-21.

Skultety, D., I. Draheim, J. Zylka and G. Geatz. 2011. Wetland delineation report: CH 40 – New City Road (FAS 624) over Brush Creek, Sangamon County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (60): 1-18.

Skultety, D., D. Ketzner and D. Keene. 2011. Wetland delineation report: Richland Creek Bike Trail, St. Clair County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (27): 1-24.

Wiesbrook, S. M., P. Marcum and B. Zercher. 2011. Wetland delineation report: CH 4 (FAS 596) over North Fork Hadley Creek, Pike County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (113): 1-18.

Wiesbrook, S. M., J. Matthews and D. Skultety. 2011. Wetland delineation report: US 12/ Illinois 59 at Fox Lake Road (FAP 334), Lake County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (20): 1-37.

Wiesbrook, S. M., D. Ketzner, B. Wilm and B. Zercher. 2011. Wetland delineation report: IL 146 (FAP 885) over Flat Lick Branch, Pope County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (36): 1-25.

Wiesbrook, S. M., V. Sivicek and B. Zercher. 2011. Wetland delineation report: Sangamon Valley Trail, Sangamon County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (46): 1-45.

Wiesbrook, S. M., V. Sivicek, J. Zylka and B. Zercher. 2011. Wetland delineation report: Oakwood Road over Indian Creek, Lake County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (24): 1-23.

Wiesbrook, S. M., B. Wilm, P. Marcum and B. Zercher. 2011. Wetland delineation report: IL 8 (FAS 1388), Peoria County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (98): 1-29.

Wiesbrook, S. M., J. Zylka and D. Szafoni. 2011. Wetland delineation report: Newton Bike Trail, Jasper County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (69): 1-77.

Wiesbrook, S. M., J. Zylka, B. Wilm, G. Geatz and B. Zercher. 2011. Wetland delineation report: Interstate 74/280 (FAI 74/280), Rock Island County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (42): 1-21.

Wiesbrook, S. M., J. Zylka, B. Wilm and B. Zercher. 2011. Wetland delineation report: I-55 at Weber Road (FAI 55), Will County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (96): 1-259.

Wilm, B., I. Draheim and D. Skultety. 2011. Wetland survey report for I-55 (FAI 55) in Will County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (15): 1-90.

Wilm, B., I. Draheim and D. Skultety. 2011. Wetland delineation report: US 52/ IL 64 (FAP 17), Carroll County, Illinois and Jackson County, Iowa. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (94): 1-50.

Wilm, B., I. Draheim and B. Zercher. 2011. Wetland delineation report: US 20 (FAP 301), Jo Daviess County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (49): 1-22.

Wilm, B., I. Draheim and B. Zercher. 2011. Wetland delineation report: CH 14 (1375N), Jasper County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (88): 1-17.

Wilm, B., I. Draheim and B. Zercher. 2011. Wetland delineation report: CH 11 over Seven Mile Creek, White County, Illinois. INHS/ IDOT Wetlands Vegetative and Soils Program Report 2011 (110): 1-14.

Wilm, B., I. Draheim and B. Zercher. 2011. Wetland delineation report: IL 13 (FAP 331) - Greenbriar Road to Shawnee Trail, Williamson County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (112): 1-15.

Wilm, B., I. Draheim, J. Zylka, M. A. Feist and B. Zercher. 2011. Wetland survey report for I-290 (FAI 290) in DuPage County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (17): 1-84.

Wilm, B., S. Wiesbrook, D. Ketzner and B. Zercher. 2011. Wetland delineation report: IL 34 (FAP 869), Saline County, Illinois. INHS/ IDOT Wetlands Vegetative and Soils Program Report 2011 (28): 1-33.

Wilm, B., S. Wiesbrook, D. Ketzner and B. Zercher. 2011. Wetland delineation report: Illinois Route 1 (FAP 332), White County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (38): 1-20.

Wilm, B., S. Wiesbrook, J. Matthews, I. Draheim and B. Zercher. 2011. Wetland mitigation site monitoring report, FAU 5822 (Milan Beltway), Rock Island County - Milan Site. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (14): 1-25.

Wilm, B., S. Wiesbrook, D. Skultety and G. Geatz. 2011. Wetland delineation report: Cedar Creek Trail, Adams County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (71): 1-9.

Wilm, B., S. Wiesbrook and D. Skultety. 2011. Wetland delineation report: I-55 (FAI 55) - Addendum A, Will County, Illinois. INHS/ IDOT Wetlands Vegetative and Soils Program Report 2011 (72): 1-27.

Zercher, B., D. Keene and D. Ketzner. Wetland delineation report: US 20 at Briar Hill Road (FAP 525), Kane County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (43): 1-29.

Zercher, B., D. Ketzner, J. Kurylo and P. Marcum. Wetland delineation report: US 14, Addendum F (FAP 305), McHenry County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (47): 1-41.

Zercher, B., D. Ketzner, J. Kurylo and P. Marcum. Wetland delineation report: US 14, Addendum G (FAP 305), McHenry County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (48): 1-49.

Zercher, B., V. Sivicek and S. Wiesbrook. Wetland delineation report: Richland Elevator Road (TR 82) over Prairie Creek, Sangamon County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (41): 1-14.

Zercher, B., S. Wiesbrook and J. Zylka. Wetland delineation report: US 6, Addendum E (FAP 856), Will County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (86): 1-55.

Zylka, J., I. Draheim, M. A. Feist and D. Skultety. 2011. Wetland delineation report: IL 23 (FAP 324) at Coral/Pleasant Grove Road, McHenry County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (109): 1-16.

Zylka, J., I. Draheim, D. Skultety and G. Geatz. 2011. Wetland delineation report: TR-30 over Crooked Creek, Calhoun County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (106): 1-18.

Zylka, J., I. Draheim and B. Zercher. 2011. Wetland delineation report: Lake of the Woods Bike Trail, Champaign County, Illinois. INHS/ IDOT Wetlands Vegetative and Soils Program Report 2011 (77): 1-8.

Zylka, J., J. Kurylo, G. Geatz and D. Skultety. 2011. Wetland delineation report: FAP 326 (IL 47/US 30), Kane and Kendall counties. INHS/ IDOT Wetlands Vegetative and Soils Program Report 2011 (63): 1-56.

Zylka, J., J. Kurylo, D. Szafoni and G. Geatz. 2011. Wetland delineation report: FAP 742/ IL 2, Ogle and Winnebago counties, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (64): 1-48.

Zylka, J., S. Wiesbrook and B. Zercher. 2011. Wetland delineation report: FAP 308 (IL 84) over ditch, Rock Island County, Illinois. INHS/IDOT Wetlands Vegetative and Soils Program Report 2011 (31): 1-18.

2011 IDOT 2011 Calendar Year - Technical Reports/ Memoranda Submitted by the Biological Survey Group

Cummings, K.S., and C. A. Taylor. 2011. Mussel survey at the U.S. Route 20 (FAP 301) bridge over Rush Creek, JoDaviess County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(23). 7 pp.

Cummings, K.S., and J.S. Tiemann. 2011. Freshwater mussels survey at the U.S. Route 136 (FAP 711) bridges over Bean and Bluegrass creeks, Vermilion County. INHS/ IDOT Statewide Biological Survey & Assessment Program Report 2011(20). 7 pp.

Enstrom, D.A. 2011. Avian survey of the Richmond Bypass U.S. Route 12 (FAP 334) Addendum C Job No: P-91-332-08 (Seq. No.: 14596C) project area. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(41).

Enstrom, D.A. 2011. Avian survey of the IL Route 173 (FAP 330) (Rosecrans Rd) IL Route 59 to U.S. Route 41; Job No.: P-91-001-10 (Seq. No.: 16513) project area. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(27).

Enstrom, D.A. 2011. Avian survey of the U.S. Route 52/IL 64 (FAP 17) Job No: P-92-001-11 (Seq. No.: 16154) project area. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(35).

Handel, W.C. 2011. 95th Street at 104th Avenue (FAU 1566) in Cook County, Illinois. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(5). 5 pp.

Handel, W.C. 2011. IDOT HSR (Union Pacific Railroad). Village of Dwight to Pontiac, Livingston County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(8). 4 pp. + maps.

Handel, W.C. 2011. North Branch Trail Extension: Devon Avenue at Caldwell to Foster Avenue at I-94 Expressway, Cook County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(10). 18 pp. + photographs and maps.

Handel, W.C. 2011. IL Route 37 (FAU 9481), from Benton Southerly to near Cleveland Street in West Frankfort, Franklin County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(11). 5 pp. + map.

Handel, W.C. 2011. US52/IL64 (FAP17) Savanna Sabula Bridge and the Mississippi Palisades State Park Entrance to Randolph Street in Savanna, Carroll County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(34). 15 pp. + photographs and maps.

Hill, S.R. 2011. I-55 (FAI 55), South of Airport Road to North of IL Route 126, 099-0407, Job No. P-91-130-07 (Seq. No. 16050), Will County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(7). 9 pp.

Hill, S.R. 2011. Rock elm monitoring and propagation; Prairie Parkway (FAP 319), Job. No. P-93-007-03 (Seq. No. 12643F), Kendall County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(12). 28 pp.

Hill, S.R. 2011. Botanical Findings for IL Route 173 (FAP 330) (Rosecrans Rd), 049-0059, 049-0195, IL Route 59 to U.S. Route 41, Job No. P-91-001-10 (Seq. No.: 16513), Antioch, Lake County, Illinois. Illinois Natural History Survey Technical Report 2011 (35). INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(25). 52 pp.

Hill, S.R. 2011. Botanical Findings for the Richmond Bypass U.S. Route 12 (FAP 334) Addendum C, Section No. 08-00190-00-PV, IL Route 31 to U.S. Route 12 (in Wisconsin), Job No. P-91-332-08 (Seq. No.: 14596C), McHenry County, Illinois. Illinois Natural History Survey Technical Report. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(42).

Johnson, K.P. 2011. IL Route 178 (FAS 1279) Bald Eagle Survey, LaSalle County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(1).

Johnson, K.P. 2011. East Side Highway Bird Survey, McLean County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(43).

Kuhns, A.R. 2011. IL Route 26 (FAP 316), IL Route 26 South of Amboy Road. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(2).

Kuhns, A.R. 2011. (FAP 336/FAU2783) Central Avenue Addendum C. Bedford Park, Burbank, Chicago State Road to 63rd Street. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(3).

Kuhns, A.R. 2011. IL Route 68 (IDOT FAP 343) at Portwine Road. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(17). 9 pp.

Kuhns, A.R. 2011. Richmond Bypass U.S. Route 12 (FAP 334) Addendum C. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(37). 12 pp.

Mengelkoch, J.M., J.F. Merritt, and J.H. Hofmann. 2011. Indiana bat and Franklin's ground squirrel Survey at Eastside Highway, I-55 near Towanda to I-74 southeast of Bloomington, IL, Sequence No. 16141, McLean County, Illinois. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(36). 17 pp.

Mengelkoch, J.M., J.F. Merritt, and J.H. Hofmann. 2011. Indiana bat survey at a bridge on TR 218 that crosses Brushy Fork, east of Newman, Illinois, Sequence No. 15848, Douglas County, Illinois. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(18). 11 pp.

Merritt, J.F., and J.M. Mengelkoch. 2011. Indiana bat survey at IL Route 119 (FAP 711), 116BR-1; SN 092-0065 over the North Fork of the Vermilion River; Job No: P-95-128-08 (Seq. No.:15358A). INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(13). 8pp.

Murphy, M.J.C. 2011. Botanical survey and assessment of the Union Pacific Industrial Support Yard Relocation, Crystal Lake, McHenry County, Illinois. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(9).

Murphy, M.J.C. 2011. U.S. Route 51 (FA 322) Addendum B EIS. Botanical survey and assessment of additional areas along U.S. Route 51, occurring in Shelby, Fayette, Marion, Clinton, and Washington counties, Illinois. INHS Technical Report 2011(31). INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(19). 43 pp.

Murphy, M.J.C. 2011. Botanical survey and assessment of IL Route 47 (FAP 326) U.S. Route 14 to Charles Road McHenry County, Illinois. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(26). 15 pp.

Murphy, M.J.C. 2011. Botanical survey and assessment of the East Side Highway, I-55 near Towanda to I-74 southeast of Bloomington, Illinois Department of Transportation Study Area, McLean County, Illinois. INHS Technical Report 2011(38). INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(38). 27 pp.

Murphy, M.J.C. 2011. Botanical survey and assessment of IDOT Wyanet Connection Study Area, between the Iowa Interstate Railroad (IAIS) and Burlington Northern Santa Fe Railroad (BNSF), Bureau County, Illinois. INHS Technical Report 2011 (39). INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(39). 18 pp.

Schelsky, W. 2011. Results of the 2010-2011 Four-season avian monitoring surveys conducted at the LaGrange Wetland Banking Site, Brown County, Illinois. IDOT Annual Report.

Taft, J.B. 2011. Notable botanical features including threatened and endangered species in the IL 178 (FAS 1279) Illinois Department of Transportation project area, La Salle County. INHS Technical Report 2011 (40). INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(33).

Taft, J.B. 2011. Notable botanical features including threatened and endangered species in the IL 137 (FAP 352) Illinois Department of Transportation project area, Lake County. INHS Technical Report 2011(36). INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(30).

Taft, J.B. 2011. Botanical survey results for Platanthera leucophaea, the eastern prairie fringed orchid, a federally threatened species, in the Willowbrook Drainage area of the Route 22 (FAP 337) Illinois Department of Transportation project area in Lake County, Illinois. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(6).

Taylor, C.A. 2011. Fish Survey, Interstate 70 [I-70] IDOT FAI 70 bridges over Kaskaskia River, Fayette County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(28).

Taylor, C.A. 2011. Crayfish Survey, Saltpetre Road / IDOT TR 603 bridge, Williamson County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(24).

Taylor, C.A., and K.S. Cummings. 2011. Fish and freshwater mussel surveys of the Embarras River for the proposed Newton Bike Trail in Newton, Jasper County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(14). 10 pp.

Taylor, C.A. 2011. Kentucky Crayfish Survey, Illinois Route 146 / IDOT FAP 885 bridge, Hardin County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(4). 4 pp.

Tiemann, J.S., C.A. Taylor, and K.S. Cummings. 2011. Fish and freshwater mussel surveys at the Illinois Route 119 (FAP 711) bridge over North Fork Vermilion River, Vermilion County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(15). 9 pp.

Tiemann, J.S., and K.S. Cummings. 2011. Freshwater mussel survey at the Lawrence Road (FAU 4079) bridge over unnamed tributary to Lawrence Creek, McHenry County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(21). 6 pp.

Tiemann, J.S., and C.A. Taylor. 2011. Fish and freshwater mussel surveys at the Deerpass Road (T59) bridges over Kishwaukee River and overflow area, McHenry County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(22). 10 pp.

Tiemann, J.S., and K.S. Cummings. 2011. Freshwater mussel survey at the Hickory Hill Road (TR 391) bridge over Skillet Fork, Wayne County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(16). 6 pp.

Tiemann, J.S., and K.S. Cummings. 2011. Freshwater mussel survey at the Union Pacific Railroad (IDOT HSR) bridge over Vermilion River, Livingston County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(31). 7 pp.

Tiemann, J.S., and K.S. Cummings. 2011. Freshwater mussel survey at the County Road 300E (TR 38) bridge over Salt Fork Vermilion River, Vermilion County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(29). 8 pp.

Tiemann, J.S., and K.S. Cummings. 2011. Freshwater mussel survey at the Illinois Route 49 (FAP 836) bridge over Salt Fork Vermilion River, Vermilion County. INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(32). 9 pp.

Wetzel, M.J., S.J. Taylor, C.A. Taylor, J.S. Tiemann, and K.S. Cummings. 2011. A limited assessment of aquatic resources (fishes, unionid mussels, other aquatic macroinvertebrates, and water quality) associated with streams in the IDOT Bloomington East Side Highway Project Area, McLean County, Illinois. INHS Technical Report 2011 (42). INHS/IDOT Statewide Biological Survey & Assessment Program Report 2011(40). 71 pp.

Gotta love those Indiana bats

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Citation:
Illinois Natural History Survey 2012. The INHS IDOT Programs 2011 Annual Report. Illinois Natural History Survey, Champaign.

Printed with soy ink on recycled and recyclable paper.